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HERBERT HOOVER, SECRETARY

BUREAU OF MINES

SCOTT TURNER, DIRECTOR

ANALYSES OF MISSOURI COALS



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PREFACE

One of the important functions of the Bureau of Mines has been the analyzing of samples of coal from every coal-mining State and from Alaska. The analyses are being published for the information of Government officials and the public.

These samples have been collected in mines by representatives of the Bureau of Mines and by geologists of the United States Geological Survey in investigations of mineral resources; they have been collected from coal delivered for use of Government departments—Treasury, Navy, and War—and for various Government institutions; they have also come from coal obtained for tests by the bureau in investigating the utilization of fuel and the explosibility of coal dust. Many samples have been collected and analyzed in connection with the work of various State geological surveys.

From time to time the bureau has published the analytical results in large bulletins. Although the analyses in any one bulletin are grouped together by States or by special uses, to look up the analyses of coals from any particular section of the country necessitates the perusal of a number of bulletins, some of which are no longer available for free distribution.

Moreover, when the bureau receives an inquiry for analyses of coal from any desired part of the country, to send a number of bulletins in order to show the analyses for an individual mine or for only one mining district in a State causes a waste of public documents. It therefore is deemed expedient to republish the analyses of coal in a series of inexpensive papers on separate States, or, if the coal production of one or more adjacent States is small, on a group of States. These papers include a brief description, abstracted from the reports of the United States Geological Survey, of the geologic structure of the coal basins in the State, or group of States, as well as a brief description of the typical mining conditions in the different districts.

Technical Paper 269, on Iowa coals, was the first of the series to be issued. This paper on Missouri coals is the ninth. The others in order are Kentucky, Ohio, Utah, Pennsylvania, Alabama, Virginia, and Tennessee. The analyses of Pennsylvania coals have been published in a bulletin issued by the Topographic and Geological Survey of the State. From time to time the various papers will be revised to include later analyses.

SCOTT TURNER, *Director*.

ANALYSES OF MISSOURI COALS

TOPOGRAPHY AND GEOLOGY OF THE COAL AREAS¹

By W. T. THOM, Jr.²

TOPOGRAPHY

In northern and western Missouri are coals of bituminous rank; in the southeastern part of the State are beds of lignite. Minor pockets of cannel coal are found at many places southeast of the



FIGURE 1.—Coal-bearing areas and producing districts of Missouri

main bituminous coal field. The large outlier of coal land in St. Louis County represents an extension of the eastern interior basin and is intimately related to the coal fields of Illinois and Indiana.

¹ The geological description has been abstracted from reports of the Missouri Bureau of Mines and Geology and of the U. S. Geological Survey.

² Geologist, U. S. Geological Survey.

The surface of the Missouri coal fields is mainly a great plain. North of Missouri River this plain has been trenched by streams into tabular plateaus; south of the river it is featured by a number of low eastward-facing escarpments that extend northeast-southwest, parallel to the edge of the coal field. These escarpments in places attain heights of about 200 feet, compared with a surface relief of 100 to 300 feet in the dissected area north of the Missouri. The slight difference between the surface features of the areas north and south of Missouri River are mainly due to the thick mantle of silt and glacial drift which obscures the bedrock and coal beds under extensive tracts north of the river.

All parts of the coal-bearing areas are within 15 miles of existing railroad lines, and additional coal spurs can be cheaply constructed.

GEOLOGIC RELATIONS

The coal-bearing rocks of Missouri, except for those of the lignite area, are of upper Carboniferous or Pennsylvanian age, and are divided into two groups—the Des Moines below and the Missouri above—which in turn are divided into formations. The formational subdivisions of these two groups and their relation to the recognized units of adjoining States are given in Table 1.

TABLE 1.—Upper Carboniferous formations of Missouri and adjoining States

Illinois	Missouri		Iowa		Kansas	Northeastern Oklahoma
Absent	Missouri group	Wabaunsee formation	Missouri group		Wabaunsee formation	Standard formational classification not yet agreed upon
McLeansboro formation		Shawnee formation			Shawnee formation	
		Douglas formation			Douglas formation	
		Lansing formation			Lansing formation	
		Kansas City formation			Kansas City formation	
Carbondale formation (top formed by No. 6 coal; base by base of No. 2 coal)	Des Moines group	Pleasanton formation	Des Moines group	Pleasanton formation	Altamont limestone	
		Henrietta formation		Henrietta formation	Henrietta formation	Bandera shale
						Pawnee limestone
						Labette shale
Cherokee shale	Cherokee shale	Cherokee shale	Fort Scott limestone			
Pottsville formation	Absent					Cherokee shale

The Des Moines group includes the topmost part of the Pottsville formation and the equivalents of the Allegheny and the basal part of the Conemaugh formation, as the Allegheny-Conemaugh boundary

falls within the Pleasanton formation. The Missouri group is equivalent to the upper part of the Conemaugh and the Monongahela.

North of Missouri River and west of its bend at Saline County the coal-bearing rocks dip nearly due west about 8 feet per mile, whereas east of that general meridian the strata are nearly level. South of the Missouri the general dip is about 6 feet per mile west. These regional dips are modified by a number of anticlinal arches 100 feet or more high, which trend northwest and southeast and commonly show steeper dips on their southwestern flanks than on their northeastern.

In Missouri the principal coal beds lie in the Cherokee shale, and development at present is confined almost wholly to the beds of that formation. The coal beds in the State from topmost to lowest are as follows:

TABLE 2.—*Coal beds of Missouri*

Wabaunsee formation:	Cherokee shale—Continued.
Nyman (Atchison County).	Bevier, Lower Rich Hill, Weir-
Shawnee formation:	Pittsburg Lower.
Elmo (Nodaway County).	Tebó.
Nodaway (Nodaway County).	Brushy Hill.
Pleasanton formation:	Jordan (Henry, St. Clair, Cedar,
Ovid (Sullivan County).	Dade, and Barton Counties).
Mulberry, Foster (Bates County).	Monteserrat (Johnson and La-
Cherokee shale:	fayette Counties).
Lexington (Mystic) (Fort Scott	Cainesville (Harrison and Mercer
red coal), Mendota.	Counties).
Summit.	Eureka (Macon and Linn Coun-
Mulky, Macon City.	ties), Waverly (Lafayette Coun-
Bedford, Upper Rich Hill, Weir-	ty).
Pittsburg Upper.	

Thin local coal beds occur in the Wabaunsee, Shawnee, Douglas, Pleasanton, and Henrietta formations, and other coals may be present in the lower part of the Cherokee shale near the Kansas State line, as the formation there contains basal beds that are absent farther to the northeast.

EXTENT OF COAL BEDS

The coal beds below the Tebo are not persistent and are mainly productive in the counties listed in Table 2. The Tebo, though locally thin, is almost everywhere present nothwest of its line of outcrop and is at present mined chiefly in Linn, Grundy, Chariton, and Henry Counties. The Bevier, Lower Rich Hill, or Weir-Pittsburg Lower coal, as it is variously called, is extensive and is mined at many places, yielding more than half of the coal produced in Missouri. The Bevier is easily identified, as it is the only bed with a limestone bottom rock and no limestone cap rock. The Bedford coal is probably of little importance outside of Livingstone County

unless the Upper Rich Hill and Weir-Pittsburg Upper coal of Bates, Vernon, and Barton Counties correspond to the Bedford. The Mulky, Summit, and Lexington beds are relatively thin but are persistent. The Mulky bed is of most importance in Montgomery, Ralls, Audrain, Macon, Randolph, Chariton, Carroll, Lafayette, and Johnson Counties, the Summit in Howard and Boone, and the Lexington in Lafayette, Ray, Putnam, and Adair Counties.

At present the larger mining operations in Missouri are concentrated in such areas as are underlain by coals that are thicker or more easily mined than those found elsewhere in the area of coal-bearing rocks. In addition to the counties already mentioned, Caldwell, Callaway, Clay, Platte, Schuyler, and Vernon Counties contain some thicker coal beds.

"Pocket" coals are worked in a small way in Moniteau and Cole Counties and are present at a number of points in areas farther south and east. Some lignite is known to be present in the Cretaceous and Tertiary rocks of the southeastern corner of the State, but the beds have not been examined in detail and they can be only of minor importance for a number of years to come.

Coal production ³ of Missouri during the past five years is given in Table 3 following:

TABLE 3.—*Coal production of Missouri, 1919-1923*

	1919	1920	1921	1922	1923
Producing counties.....	29	29	28	28	27
Coal produced:					
Loaded at mines for shipment, tons....	3,414,223	4,811,598	3,209,406	2,620,074	3,101,275
Sold to local trade and used by employees, tons.....	422,479	420,318	242,136	228,327	211,447
Used at mines for steam and heat, tons.....	143,096	137,649	99,989	76,349	90,429
Total.....	3,070,798	5,369,565	3,551,621	2,924,750	3,403,151
Average value per ton.....	\$3.21	\$4.16	\$3.92	\$3.81	\$3.40
Employees:					
Underground.....	7,235	6,865	6,971	7,218	5,552
Surface.....	2,079	1,973	1,584	1,532	1,400
Total.....	9,314	8,838	8,555	8,750	6,952
Average time worked, days.....	175	233	166	113	155

³ Tryon, F. G., and Hale, S. A., Coal in 1919, 1920, and 1921: Mineral Resources of the United States, 1921, Pt. II, U. S. Geol. Survey, 1923, pp. 596-597.

MINING METHODS

BY C. A. HERBERT⁴

The coal reserves of the State of Missouri before mining began have been estimated by the Missouri State Geological Survey at approximately 79,000,000,000 tons. Of this amount, about one-half of one per cent has been exhausted.

The annual output of the State ranges from three to five million tons, and though perhaps five or six times this amount of coal annually is used in the State, yet, because the coal beds are thin, mining costs high, and the coal inferior in quality to most of the coals in the adjoining States, the mines are restricted to local markets where low freight rates offset the disadvantages of high mining costs and inferior quality.

Missouri has four continuous workable beds, which in downward order are as follows: Lexington, Mulky, Bevier, and Tebo. In addition, there are several beds of small extent. All of these beds lie practically flat, except for local "hills" and "swamps."

The Upper or Lexington bed averages 18 to 23 inches in thickness, and in some places coal as thin as 15 inches is being successfully mined.

This bed is mined on a longwall advancing system with face tracks. Roadways are maintained at approximately right angles to the face and 480 feet apart, and the face tracks are connected to them. The natural conditions are admirably adapted to this system, the roof is generally good, and in some areas a so-called block slate above the coal comes down in rectangular blocks, with which pack walls and supports are built. Where this block slate occurs few props are needed. Just above the slate is a strong limestone 8 to 10 feet thick which permits ample space for the track and cars between the face and the pack walls. Just below the coal is a fire clay in which the mining is done either by hand or by longwall machine. In nearly all of the large shipping mines the coal is undercut by machine.

The haulage entries, from which the face tracks branch off, are kept high enough for mules by brushing, either in the bottom or partly in the top and partly in the bottom.

The cars, which are merely low flat trucks without sides, are pushed along the face by hand. In loading a car the miner builds up the

⁴ Mining engineer, Bureau of Mines.

large lumps around the outside and puts the smaller coal in the center.

Because the coal is blocky and because no explosives are used, little fine coal is made. Practically all of the coal is loaded on the car by hand without the use of a shovel.

The Mulky bed averages about 20 inches thick. The natural mining conditions are similar to those of the Lexington bed, and the coal is worked on the face-track system of longwall generally used in the Lexington bed.

The Bevier bed is the most important of the Missouri coals because of its extent and thickness. It averages about 4 feet thick but in places thickens to $5\frac{1}{2}$ or 6 feet; it is characterized by a clay parting 8 to 12 inches above the bottom. Below the coal is a soft fire clay that has a tendency to heave when wet. The roof ranges from a soft shale to a sandstone and, though in some places it may stand for a while without timbering, it soon weathers and loosens, requiring both the rooms and entries to be carefully timbered.

With few exceptions the mines in the Bevier bed are worked by the room-and-pillar method, and, except in one or two mines where machines are being introduced, the coal is all shot from the solid with black blasting powder. Where the roof is soft the heavy shooting causes considerable trouble, and also makes it almost impossible to prevent the clay parting from becoming mixed with the fine coal.

The main entries are usually driven 7 to 8 feet wide; side entries are driven 12 to 16 feet wide with the track along one rib. The space between the track and the opposite rib is utilized for the stowage of rock from brushing and from falls of roof in the entries. In both rooms and entries it is the custom to take up 12 to 18 inches of fire-clay bottom to get sufficient height for the cars and mules.

In the few mines where mining machines have been introduced, 42-foot rooms are driven with less trouble from roof falls than 26-foot rooms in mines where the coal is shot from the solid, because of the absence of excessive shooting. In these wide rooms the tracks are laid along each rib.

Little or no attempt is made to recover room or entry pillars, and as a consequence the extraction probably does not exceed 50 per cent.

The few mines in the Bevier bed that are working by the longwall system, as well as all of the mines working in the Tebo bed, are using the longwall advancing system, which is general in northern Illinois. The adoption of this system rather than the face-track system was made necessary by the soft shale roof of both the Bevier and Tebo beds.

In this system the branch roads, run on 42-foot centers at nearly right angles to the face and are maintained by brushing down the

roof at the road head and using the rock for pack walls along the sides of the roadway. These branch roads are cut off every 300 feet by 45° crossroads or headings, from which the branch roads are continued. The space between the pack walls is utilized for the stowage of any rock that may come with the coal and for the clay that is taken out in the undermining. A considerable amount of timber is required along the face to support temporarily the roof between the face and the gobbed material. The coal is undermined both by hand and by electric-chain machine. The mining is done in the clay beneath the coal.

ANALYSES OF MINE SAMPLES

BY A. C. FIELDNER,⁵ H. M. COOPER,⁶ and F. D. OSGOOD⁷

The analyses in Table 4 are arranged geographically with respect to county and towns, and are grouped as follows:

1. The proximate analysis—moisture, volatile matter, fixed carbon, and ash.
2. The ultimate analysis—carbon, hydrogen, nitrogen, oxygen, sulphur, and ash.
3. The calorific value of heat of combustion.
4. The softening temperature of ash, when such determinations were made.

Ultimate analyses are given in three conditions—(1) as received; (2) moisture free; and (3) moisture and ash free. Proximate analyses and heating values are given in two conditions—(1) as received and (2) moisture free.

The as-received condition represents the sample as received at the laboratory, whereas the moisture-free condition represents the composition and heating value of the dry coal. The moisture and ash-free condition represents approximately the composition and calorific value of the dry combustible matter.

The analyses are given to the nearest 0.1 per cent, and the British thermal unit to the nearest 10, although the laboratory determinations are made to the nearest 0.01 per cent and the nearest British thermal unit.

SOURCES OF INFORMATION

Many analyses from old reports of the Missouri Geological Survey have been purposely left out because of lack of uniformity in methods of sampling and analysis. Those that are presented in the table were collected and analyzed by the approved methods⁸ adopted by the United States Geological Survey and Bureau of Mines. The samples themselves were collected by geologists of the Missouri Survey, and were analyzed in the laboratories of the United States Geological Survey at the coal-testing plant at St. Louis, and the

⁵ Fieldner, A. C., chief chemist, Bureau of Mines.

⁶ Cooper, H. M., associate chemist, Pittsburgh Experiment Station.

⁷ Osgood, F. D., assistant chemist, Pittsburgh Experiment Station.

⁸ Stanton, F. M., and Fieldner, A. C., Methods of analyzing coal and coke: Tech. Paper 8, Bureau of Mines, 1913, 42 pp.

Bureau of Mines laboratory at Pittsburgh, Pa. Analyses have been copied from Bulletins 22, 85, and 123 and include analyses of all samples received up to August 1, 1923.

FUSIBILITY OF ASH

In general, the softening temperature of coal ash from the coals of the United States¹ ranges from 1,900° to 3,100° F. For convenience the order of fusibility may be expressed by subdividing this range of softening temperature into three groups, as follows:

Class I. Refractory ash, softening above 2,600° F.

Class II. Ash of medium fusibility, softening between 2,200° and 2,600° F.

Class III. Easily fusible ash, softening below 2,200° F.

The softening temperature is defined as the temperature at which a cone of the ash, when heated in the test furnace with a slightly reducing atmosphere, has fused down to a spherical lump.

The Bureau of Mines has determined the softening temperatures of the ash of a large number of the coals in the United States. The coals of Missouri which were tested gave fusion points that were low, and they lie, in the easily fusible Class III, ranging from 1,930° to 2,100° F. This low softening temperature is a marked characteristic of the coals of the interior region, of which the Missouri coal fields are a part. The actual observed temperatures for those samples that were tested will be found in column 17 of Table 4.

¹ Selvig, W. A., and Fieldner, A. C., Fusibility of ash from coals of the United States: Bull. 209, Bureau of Mines, 1922, 119 pp.

TABLE 4.—*Chemical analyses of mine samples*

Locality, mine, etc.	Sample			Proximate				Ultimate				Air dry- ing loss	Calorific value		Soft- ening tem- per- ature, °F. ^a	Ref- er- ence bulle- tin No. ^a	
	Lab- ora- tory No.	Kind ^a	Con- di- tion ^a	Mois- ture	Vola- tile mat- ter	Fixed car- bon	Ash	Sul- phur	Hy- dro- gen	Car- bon	Ni- tro- gen		Oxy- gen	Chlo- rides			British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ADAIR COUNTY																	
Kirksville; Big Creek No. 1 mine, Bevier bed.....	75558	B		1 2 3	10.8 43.3 48.7	38.6 40.7 45.6	9.9 11.1 51.3	3.6 4.0 4.6	5.6 5.0 5.6	63.7 71.4 80.4	1.1 1.2 1.4	16.1 7.3 8.0	4.5	6,334 7,100 7,989	11,400 12,780 14,380	1,970	26
1/4 mile west of Star mine, Tebo bed (?), (in mine, 30 feet south of shaft).....	14799	B		1 2 3	16.0 45.4 50.7	38.2 44.3 49.3	8.7 10.3 40.3	4.1 4.9 5.5	4.9 70.3 78.4	59.1 70.3 78.4	0.9 1.1 1.3	21.3 8.5 9.3	11.0	6,000 7,139 7,981	10,800 12,850 14,330	2,010	85
Same (in mine, 12 feet northeast of shaft).....	14800	B		1 2 3	13.9 43.9 49.8	37.8 44.3 50.2	10.2 11.8 50.2	6.0 6.9 7.8	5.0 4.8 5.5	58.8 68.3 77.4	1.0 1.2 1.3	18.3 7.0 8.0	9.4	6,028 7,006 7,944	10,850 12,610 14,300	1,990	85
Rocky Ford No. 1 mine, Bevier bed (face of 3 room, 1 north entry, 300 feet northwest of shaft).....	10101	A		1	14.8	32.5	39.8	12.9	3.6				11.1			2,030	22
Same (300 feet northeast of shaft).....	10102	A		1	14.8	32.7	38.0	14.5	3.7				11.0			1,980	22
Same (composite of samples 10101 and 10102).....	10106	A		2 3	14.6 37.5	32.1 46.2	39.4 16.3	13.9 55.2	4.6 5.5	56.1 78.5	.9 1.3	19.8 9.5	11.1	5,700 6,672 7,972	10,290 12,010 14,350		22
Star No. 1 mine, Bevier bed (350 feet northwest of shaft).....	10100	A		1	13.8	33.0	39.7	13.5	5.5				8.9			1,940	22
Same (main entry, 250 feet east of shaft).....	10099	A		1	14.7	32.4	39.9	13.0	5.0				10.7			1,950	22
Same (composite of samples 10100 and 10099).....	10442	A		2 3	14.4 37.7	32.3 47.0	40.2 15.3	5.3 7.3	5.6 5.5	56.4 77.9	1.0 1.4	18.6 7.9	9.8	5,722 6,683 7,894	10,300 12,030 14,210		22
Morrow Township; No. 1 mine, Lexington bed (2,000 feet north of drift mouth).....	10079	A		1	16.1	36.1	38.8	9.0	3.1				10.1				22
Same (2,100 feet northwest of drift mouth).....	10080	A		1	15.4	34.7	38.9	11.0	4.0				9.2			1,990	22
Same (2,000 feet northeast of drift mouth).....	10077	A		1	15.6	34.7	36.0	13.7	3.8				9.3			1,950	22
Same (composite of samples 10077, 10079, and 10080, inclusive).....	10081	A		2 3	15.4 41.1	34.8 45.9	38.8 13.0	11.0 4.8	5.9 4.2	57.1 67.4	.9 1.1	21.5 9.4	9.5	5,811 6,867 7,889	10,460 12,390 14,200		22
Nineveh Township; No. 1 mine, Bevier bed (1,050 feet south of drift mouth).....	10086	A		1	15.3	33.1	36.6	15.0	3.5				10.0			2,100	22
Same (2,500 feet west of drift mouth).....	10085	A		1	17.4	30.7	41.5	10.4	3.5				13.4			1,870	22

Figures in column 17 denote temperature at which a coal ash will fuse to a spherical lump when heated in a furnace in a reducing atmosphere.

TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate				Ultimate				Calorific value		Softening temperature, °F.	Reference bulletin No.		
	Lab- ora- tory No.	Kind	Con- di- tion	Mois- ture	Vola- tile mat- ter	Fixed car- bon	Ash	Sul- phur	Hy- dro- gen	Car- bon	Ni- tro- gen	Oxy- gen	Air dry- loss			Calo- ries	British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AUDRAIN COUNTY—continued																	
Vandalia; Standard mine, Mulky bed (south wall, 1,000 feet from shaft)	9982	A	1	10.2	39.1	38.2	12.5	5.3					6.9			1,970	22
Same (west wall, 800 feet from shaft)	9983	A	1	10.6	39.1	37.2	13.1	4.4					7.8			1,890	22
Same (face of north entry, 800 feet from shaft)	9984	A	1	10.7	38.9	39.3	11.1	4.8					7.5			1,890	22
Same (composite of samples 9982 to 9984, inclusive)	9993	A	1	10.4	39.3	38.0	12.3	4.9	5.5	61.1	1.0	15.2	7.4	6,306	11,350		22
			2			43.8	42.4	13.8	5.5	4.8	68.2	1.1	6.6	7,033	12,600		
			3			50.8	49.2		6.3	5.6	79.1	1.2	7.8	8,156	14,680		
BARTON COUNTY																	
Mindenmines, 1 mile northeast of; Pullen No. 1 mine, Wier-Pittsburgh lower bed (face of south entry, 600 feet from shaft)	11177	A	1	5.4	32.3	53.8	8.5	3.6					4.2			1,980	85
Same (face of west entry, 400 feet from shaft)	11178	A	1	5.4	32.7	52.1	9.8	3.6					4.2			1,980	85
Same (face of northeast entry, 600 feet from shaft)	11179	A	1	5.5	32.3	53.5	8.7	3.4					4.2			1,920	85
Same (composite of samples 11177 to 11179, inclusive)	11180	A	1	5.4	32.1	53.5	9.0	3.6	5.4	71.6	1.4	9.0	4.2	7,217	12,900		85
			2			56.6	9.5	3.8	5.1	75.7	1.5	4.4		7,633	13,740		
			3			62.6		4.2	5.6	83.6	1.6	5.0		8,428	15,170		
2 miles northwest of; No. 17 mine, Wier-Pittsburgh lower bed (face of entry, 1,000 feet northeast of shaft)	11185	A	1	6.3	30.1	51.5	12.1	5.5					4.7			1,920	85
Same (face of entry, 1,000 feet southeast of shaft)	11186	A	1	6.1	32.7	52.1	9.1	4.1					4.6			1,900	85
Same (face of entry, 1,500 feet northwest of shaft)	11187	A	1	5.1	32.0	49.7	13.2	5.0					3.7			1,940	85
Same (composite of samples 11185 to 11187, inclusive)	11188	A	1	5.9	31.0	51.6	11.5	5.0	5.1	67.6	1.1	9.7	4.3	6,856	12,340		85
			2			54.9	12.2	5.3	4.7	71.9	1.2	4.7		7,283	13,110		
			3			62.5		6.1	5.4	81.8	1.3	5.4		8,294	14,930		
Mulberry, 2½ miles northeast of; Carney-Cherokee No. 2 mine, Wier-Pittsburgh Lower (Cherokee No. 1) bed	75557	B	1	6.1	30.6	50.2	13.1	5.0	5.0	66.7	1.1	9.1	3.2	6,783	12,210		(27)
			2			53.5	13.9	5.3	4.6	71.1	1.2	3.9		6,833	12,300		
			3			62.1		6.2	5.3	82.6	1.4	4.5		8,394	15,110		

Pittsburgh (Kans.), 4 miles east and 3 miles north of; J. J. Stephenson mine, Cherokee bed (face of workings, steam-shovel strip pit).	B	23241	1	6.3	35.3	51.9	6.5	3.7	5.5	72.6	1.3	10.4	4.2	7,339	13,210	2,020	123
			2	---	37.7	53.3	7.0	4.0	5.1	77.0	1.4	5.9	---	7,339	14,110	---	---
			3	---	40.5	56.5	---	4.3	5.5	83.4	1.5	5.3	---	8,428	15,170	---	---
Same (1,000 feet east from tippie along fault, "dead" coal).	B	23242	1	38.5	23.4	30.9	7.2	0	5.9	38.5	1.8	47.0	20.7	3,250	5,850	2,260	123
			2	---	34.1	50.2	11.7	0	2.7	62.0	1.4	20.7	---	5,269	9,520	---	---
			3	---	43.1	55.9	---	1.0	3.0	70.9	1.5	23.6	---	5,989	10,780	---	---
Same (200 feet from east line of pit, "shelly" coal).	B	23243	1	16.2	27.9	52.7	3.2	0	5.4	64.3	1.1	25.1	11.3	6,106	10,990	2,170	123
			2	---	33.3	62.8	3.9	1.1	4.3	76.7	1.4	12.6	---	7,283	13,110	---	---
			3	---	34.7	65.3	---	1.1	4.5	70.8	1.4	13.2	---	7,578	13,640	---	---
BATES COUNTY																	
Amsterdam, southern part of; No. 1 mine, Mulberry bed (face of entry, 400 feet east of shaft).	A	11306	1	9.8	31.2	42.6	16.4	4.1	---	---	---	---	8.2	---	---	1,940	85
			1	8.7	33.1	44.7	13.5	3.6	---	---	---	---	7.2	---	---	1,950	85
			1	9.1	32.5	44.2	14.2	4.0	---	---	---	---	7.3	---	---	1,940	85
Same (face of entry, 400 feet south of shaft).	A	11307	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Same (face of entry, 400 feet southeast of shaft).	A	11308	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Same (composite of samples 11306 to 11308, inclusive).	A	11309	1	9.2	32.1	44.2	14.5	4.0	5.1	61.5	1.0	13.9	7.6	6,228	11,210	---	85
			2	---	33.4	48.6	16.0	4.4	4.5	67.7	1.1	6.3	---	6,856	12,340	---	---
			3	---	42.1	57.9	---	5.2	5.4	80.6	1.3	7.5	---	8,161	14,660	---	---
Foster, 2 miles southwest of; Walnut mine, Mulberry bed (face of 1 south entry, 500 feet southeast of mine mouth).	A	A-2815	1	13.2	29.7	45.0	12.1	2.1	---	---	---	---	7.9	6,000	10,800	2,040	(27)
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	10.9	30.6	45.8	12.7	2.3	---	---	---	---	6.3	6,128	11,030	2,040	(27)
Same (face of main east entry, 500 feet east of mine mouth).	A	A-2816	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	12.2	30.2	45.2	12.4	2.2	5.5	61.4	1.3	17.2	7.1	6,050	10,800	---	(27)
			2	---	34.4	51.5	14.1	2.6	4.7	69.9	1.5	7.2	---	6,804	12,410	---	---
Same (composite of samples A-2815 and A-2816).	A	A-2817	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			2	---	40.1	59.9	---	3.0	5.4	81.4	1.7	8.5	---	8,028	14,450	---	---
			3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hume, 3½ miles north of; N. & S. Coal Co. mine, Mulberry bed (at loading shovel in pit).	A	A-1959	1	11.8	32.1	43.3	12.8	2.7	---	---	---	---	7.7	6,122	11,020	1,940	(27)
			1	13.1	30.9	43.3	12.7	2.5	---	---	---	---	10.4	6,033	10,800	2,040	(27)
			1	12.5	31.1	43.6	12.8	2.7	5.5	60.9	1.3	16.8	9.0	6,067	10,920	---	(27)
Same (240 feet ahead of loading shovel in pit).	A	A-1960	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			2	---	35.6	49.8	14.6	3.1	4.7	69.6	1.5	6.5	---	6,939	12,490	---	---
			3	---	41.7	58.3	---	3.6	5.5	81.5	1.7	7.7	---	8,128	14,630	---	---
Same (composite of A-1959 and A-1960).	A	A-1961	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			3	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4 miles east of, 10 miles west of Rich Hill; No. 1 mine, Mulberry bed (face of entry, 900 feet northwest of shaft).	A	11226	1	12.4	30.0	45.9	11.7	2.0	---	---	---	---	9.8	---	---	2,070	85
			1	12.8	31.0	46.8	9.4	1.7	---	---	---	---	10.4	---	---	---	85
			1	11.4	31.0	46.5	11.1	2.5	---	---	---	---	9.5	---	---	1,940	85
Same (face of entry, 1,100 feet west of shaft).	A	11227	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Same (face of entry, 700 feet southwest of shaft).	A	11228	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Same (composite of samples 11226 to 11228, inclusive).	A	11229	1	12.3	30.4	46.6	10.7	2.1	5.5	63.3	1.2	17.2	9.9	6,278	11,300	---	85
			2	---	34.6	53.2	12.2	2.4	4.7	72.1	1.4	7.2	---	7,156	12,880	---	---
			3	---	39.4	60.6	---	2.7	5.4	82.1	1.6	8.2	---	8,144	14,660	---	---

• Modified volatile.

43092°—261—3

TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate				Ultimate				Calorific value		Softening temperature, °F.	Reference bulletin No.		
	Lab- ora- tory No.	Kind	Con- di- tion	Mois- ture	Vola- tile mat- ter		Ash	Sul- phur	Hy- dro- gen	Car- bon	Ni- tro- gen	Oxy- gen	Air dry- ing loss			Calo- ries	British thermal units
					6	7												8	9	10	11	12	13	14	15	16	17
1	2	3	4	5	6	7	8										18
BATES COUNTY—continued																	
New Home; New Home No. 1 mine, Lower Rich Hill bed (face of entry, 200 feet northeast of shaft).....	11222	A	1	9.3	34.0	43.9	12.8	3.8									85
	11223	A	1	10.1	32.5	43.2	14.2	4.5									85
	11224	A	1	10.6	31.3	41.8	16.3	6.8									85
	11225	A	2	10.0	33.1	42.4	14.5	5.1	5.3	60.3	1.0	13.8	8.3	6,194	11,150		85
New Home No. 1 mine (face of 1 east entry, 18 room).....	1041	A	1	4.8	38.1	42.9	14.2	5.3	4.6	67.0	1.1	5.6		6,883	12,300		22
	1043	A	2	4.9	40.0	45.1	14.9	5.6	5.5	73.8	1.3	6.7		8,200	14,760		22
			2	4.9	38.3	42.3	14.5	5.3						6,656	11,980		22
			2	4.9	40.3	44.5	15.2	5.6						8,256	14,860		22
Rich Hill, 2 miles northwest of Fleming pit No. 1 mine, Lower Rich Hill bed (face of entry, north side of pit).....	11197	A	1	7.8	35.4	45.6	11.2	4.1					6.1				85
	11198	A	1	8.0	35.4	43.6	13.0	5.1					6.4				85
	11199	A	1	7.6	35.1	43.6	13.7	5.9					6.1				85
	11200	A	1	7.8	35.5	44.0	12.7	5.2	5.4	63.2	1.0	12.5	6.2	6,522	11,740		85
2 miles south of Ritchie pit No. 1, Lower Rich Hill bed (face of entry, north side of pit).....			2	38.5	47.7	13.8	5.6	4.9	68.5	1.1	6.1			7,078	12,740		
			3	44.7	55.3		6.5	5.7	79.5	1.3	7.0			8,206	14,770		
	11193	A	1	9.7	34.0	42.5	13.8	5.2					8.4				85
	11194	A	1	8.5	34.9	40.5	16.1	4.3					7.3				85
Same (face of entry, south side of pit).....	11195	A	1	9.2	34.3	41.3	15.2	4.9	5.3	60.2	1.1	13.3	7.9	6,194	11,150		85
		2		37.8	45.5	16.7	5.4	4.8	66.3	1.2	5.6			6,822	12,280		85
		3		45.4	54.6		6.5	5.7	79.6	1.5	6.7			8,194	14,750		
Ritchie Pit No. 2, Lower Rich Hill bed (face of entry, south side of pit).....	*11196	A	1	36.0	22.5	26.9	14.6	8	5.9	33.2	7	44.8	30.1	2,922	5,260		85
			2	35.2	41.9	22.9		1.3	3.0	51.9	1.1	19.8		4,561	8,210		
			3	45.6	54.4			1.7	3.9	67.3	1.4	25.7		5,911	10,640		
Worland; Valentine mine, Mulberry bed (20 feet ahead of leading shovel in pit).....	A-1838	A	1	11.6	31.7	44.4	12.3	2.5					6.3	6,283	11,310	2,240	(28)
	A-1839	A	1	10.0	31.8	44.9	13.3	2.5					5.5	6,272	11,290	2,010	(28)

Modified volatile.

TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate				Ultimate					Calorific value			Ref-er-ence bulle-tin No.	
	Lab-or-a-tory No.	Kind	Con-di-tion	Mois-ture	Vola-tile car-bon mat-ter	Fixed car-bon	Ash	Sul-phur	Hy-dro-gen	Car-bon	Ni-tro-gen	Oxy-gen	Air dry-ing loss	Calo-ries	British thermal units		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CALLAWAY COUNTY																	
Fulton, 1½ miles southwest of: Grennel mine, Bevier bed (200 feet southwest of shaft).....	75562	B	1 2 3	7.9 37.7 44.3	34.7 37.7 44.3	43.7 47.4 55.7	13.7 14.9	5.7 6.2 7.3	5.2 4.6 5.5	62.0 67.3 79.0	1.0 1.0 1.2	12.4 6.0 7.0	3.5	6,283 6,822 8,017	11,310 12,280 14,430	2,000	(30)
2 miles southwest of: No. 1 mine, Bevier bed (face of entry, 1,000 feet east of shaft).....	11501	A	1	11.0	33.5	45.1	10.4	3.7					9.5			1,980	85
Same (face of entry, 600 feet northeast of shaft).....	11502	A	1	10.2	32.2	46.4	11.2	4.2					8.6			2,000	85
Same (face of entry, 600 feet southwest of shaft).....	11503	A	1	11.2	33.4	45.5	9.9	3.9					9.8			1,980	85
Same (composite of samples 11501 to 11503, inclusive).....	11504	A	1	10.8	32.8	46.0	10.4	4.0	5.4	63.7	.9	15.6	9.3	6,389	11,500		85
CLAY COUNTY																	
Missouri City: Missouri City No. 1 mine, Lexington bed (face of west entry, 1,500 feet from shaft).....	10221	A	1	14.4	33.5	40.0	12.1	3.0					11.1			2,020	22
Same (1,800 feet from shaft).....	10220	A	1	14.2	34.0	39.4	12.4	2.9					10.5			2,030	22
Same (face of west entry, 1,800 feet from shaft).....	10219	A	1	14.7	32.8	39.6	12.9	3.1					11.8			1,980	22
Same (composite of samples 10219 to 10221, inclusive).....	10231	A	1 2 3	14.3 38.8 45.5	33.3 38.8 45.5	39.9 46.6 54.5	12.5 14.6	2.9 3.4 4.0	5.7 4.8 5.6	58.1 67.8 79.3	1.0 1.1 1.3	19.8 8.3 9.8	11.1	5,811 6,772 7,933	10,460 12,190 14,280		22
GRUNDY COUNTY																	
Trenton, ½ mile south of: Trenton No. 3 mine, Tebo (?) bed (face of west entry, 500 feet from shaft bottom).....	10153	A	1	13.4	37.5	37.7	11.4	3.0					5.4			2,320	22
Same (500 feet from hoisting shaft).....	10151	A	1	12.6	40.1	39.4	7.9	2.8					4.6			2,310	22
Same (face of north entry, 500 feet from hoisting shaft).....	10152	A	1	11.6	37.3	35.4	15.7	3.7					4.8			2,140	22

Same (composite of samples 10151 to 10153, inclusive)	A	10161	1	11.9	38.2	38.3	11.6	3.1	5.6	61.4	1.0	17.3	4.9	6,156	11,080	22
			2	43.3	43.5	13.2	3.5	4.9	69.8	1.2	7.4	7.4	8,089	12,580	85	
			3	49.9	50.1	---	4.1	5.6	80.4	1.4	8.5	8.5	8,050	14,490		
HARRISON COUNTY																
Cainsville; Cainsville mine, Cainsville bed (main west air course, 600 feet west and 30 feet north of shaft)	B	12679	1	13.0	39.7	35.4	11.9	5.2	---	---	---	---	7.8	5,867	10,560	85
			2	45.6	40.7	13.7	6.0	---	---	---	---	---	---	6,739	12,130	
Same (2 south entry, main east entry, 150 feet east and 350 feet south of shaft)	B	12680	1	11.7	38.8	38.8	10.7	5.1	---	---	---	---	8.8	6,122	11,020	85
			2	43.9	44.0	12.1	5.8	---	---	---	---	---	---	6,933	12,480	
Same (2 south entry, main west entry, 400 feet southwest of shaft)	B	12681	1	13.1	38.9	37.3	10.7	4.8	---	---	---	---	10.1	6,044	10,880	85
			2	44.8	42.9	12.3	5.5	---	---	---	---	---	---	6,961	12,530	
Melbourne, ¼ mile east of; Trenton No. 1 mine, Lexington bed (face of entry, 90 feet south of shaft)	A	11374	1	15.2	37.3	40.5	7.0	2.9	---	---	---	---	11.6	---	---	85
			1	15.1	37.4	40.1	7.4	3.3	---	---	---	---	12.1	---	---	
		11375	1	15.1	37.4	40.1	7.4	3.3	---	---	---	---	12.1	---	---	
		11376	1	15.8	35.8	42.9	5.5	2.8	---	---	---	---	12.4	---	---	
			1	15.3	37.1	40.8	6.8	3.0	5.9	61.2	1.1	22.0	12.0	6,167	11,100	
Same (face of entry, 30 feet north of shaft)	A	11377	2	43.9	48.1	8.0	3.6	5.0	72.3	1.3	9.8	9.8	7,283	13,110	---	85
			2	47.7	52.3	---	3.9	5.4	78.6	1.4	10.7	10.7	7,917	14,260	---	
			3	---	---	---	---	---	---	---	---	---	---	---	---	
HENRY COUNTY																
Calhoun, 2¼ miles west of; Parks No. 1 mine, Tebo bed (face of entry, 700 feet southeast of mine mouth)	A	11314	1	10.6	36.0	41.3	12.1	3.7	---	---	---	---	8.6	---	---	85
			1	10.6	38.9	39.9	10.6	3.5	---	---	---	---	7.9	---	---	
		11315	1	10.9	37.0	40.2	11.9	3.5	---	---	---	---	9.5	---	---	
		11316	1	10.6	37.2	40.7	11.5	3.6	5.4	61.8	9	16.8	8.7	6,250	11,250	
		11317	2	41.7	45.4	12.9	4.0	4.7	69.1	1.0	8.3	8.3	6,989	12,580	---	
Same (face of entry, 800 feet west of mine mouth)	A		3	47.8	52.2	---	4.6	5.4	79.4	1.2	9.4	9.4	8,022	14,440	---	85
			1	8.2	36.6	38.8	16.4	4.8	---	---	---	---	6.8	---	---	
		11302	1	10.9	35.1	39.6	14.4	3.9	---	---	---	---	9.3	---	---	
Same (face of entry, 100 feet northwest of shaft)	A	11303	1	18.8	32.1	37.6	11.5	2.3	---	---	---	---	15.9	---	---	85
		11304	1	12.6	34.7	38.7	14.0	3.7	5.5	58.4	1.0	17.4	10.7	5,930	10,710	
		11305	2	39.7	44.3	16.0	4.2	4.7	66.8	1.1	7.2	7.2	6,806	12,250	---	
Same (composite of samples 11302 to 11304, inclusive)	A		3	47.2	52.8	---	5.0	5.6	79.5	1.3	8.6	8.6	8,100	14,580	---	85
			1	12.3	33.3	41.5	12.9	2.4	---	---	---	---	10.1	---	---	
		11370	1	13.1	34.3	44.3	8.3	2.1	---	---	---	---	10.4	---	---	
Same (face of entry, 100 feet south of shaft)	A	11371	1	12.8	33.3	43.1	10.8	3.0	---	---	---	---	10.4	---	---	85
		11372	1	12.8	33.1	43.6	10.6	2.6	5.5	61.9	1.1	18.3	10.3	6,206	11,170	
		11373	2	37.9	50.0	12.1	3.0	4.7	70.9	1.3	8.0	8.0	7,111	12,800	---	
Same (composite of samples 11370 to 11372, inclusive)	A		3	43.1	56.9	---	3.4	3.4	80.7	1.5	9.1	9.1	8,089	14,560	---	85
			3	---	---	---	---	---	---	---	---	---	---	---	---	
2 miles east of; Pharis No. 1 mine, Jordan bed (face of entry, 100 feet west of shaft)																
Same (face of entry, 100 feet south of shaft)	A	11370	1	12.3	33.3	41.5	12.9	2.4	---	---	---	---	10.1	---	---	85
		11371	1	13.1	34.3	44.3	8.3	2.1	---	---	---	---	10.4	---	---	
		11372	1	12.8	33.3	43.1	10.8	3.0	---	---	---	---	10.4	---	---	
Same (face of entry, 50 feet east of shaft)	A		2	37.9	50.0	12.1	3.0	4.7	70.9	1.3	8.0	8.0	7,111	12,800	---	85
		11373	2	43.1	56.9	---	3.4	3.4	80.7	1.5	9.1	9.1	8,089	14,560	---	
Same (composite of samples 11370 to 11372, inclusive)		A		3	---	---	---	---	---	---	---	---	---	---	---	
			3	---	---	---	---	---	---	---	---	---	---	---	---	

TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate				Ultimate				Calorific value		Softening temperature, °F.	Reference bulletin No.		
	Lab-oratory No.	Kind	Con-dition	Mois-ture	Vola-tile matter	Fixed carbon	Ash	Sul-phur	Hy-dro-gen	Car-bon	Ni-tro-gen	Oxy-gen	Air drying loss			Calo-ries	British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
HENRY COUNTY—continued																	
Clinton, 3 miles southeast of; Sheldon mine No. 1, Jordan bed (face of entry, 80 feet southwest of shaft) Same (face of entry, 110 feet south of shaft) Same (face of entry, 110 feet southeast of shaft) Same (composite of samples 11262 to 11264, inclusive)	11262	A	1	9.6	34.7	43.1	12.6	5.7					7.9			2,010	85
	11263	A	1	10.6	33.6	43.8	12.0	5.4					8.9			1,980	85
	11264	A	1	9.7	36.6	43.5	10.2	5.1					8.1			1,960	85
	11265	A	1	9.9	35.0	43.3	11.8	5.4	5.4	62.0	1.1	14.3	8.3	6,356	11,440		85
			2			38.9	48.0	13.1	6.0	4.8	68.8	1.2	6.1		7,056	12,700	
		3			44.7	55.3		6.9	5.5	79.1	1.4	7.1		8,117	14,610		
3½ miles northwest of; Lane No. 1 mine, Tebo bed (face of entry, 210 feet northwest of mine mouth) Same (face of entry, 300 feet northeast of mine mouth) Same (face of entry, 230 feet north of mine mouth) Same (composite of samples 11248 to 11250, inclusive)	11248	A	1	8.5	38.0	40.9	12.6	4.2					6.4			1,950	85
	11249	A	1	8.4	36.9	40.5	14.2	3.7					5.3			2,080	85
	11250	A	1	10.7	35.4	41.2	12.7	3.7					7.6			1,980	85
	11251	A	1	9.1	37.4	40.5	13.0	3.8	5.4	62.5	.9	14.4	6.4	6,367	11,460		85
			2			41.2	44.5	14.3	4.2	4.8	68.8	1.0	6.9		7,006	12,610	
Deepwater, eastern part of; Dickey No. 1 pit, Jordan bed (face, on north side of pit) Same (face, on east side of pit) Same (face, on west side of pit) Same (composite of samples 11310 to 11312, inclusive)	11310	A	1	10.0	33.8	46.5	9.7	3.5					8.3			1,990	85
	11311	A	1	9.8	33.9	46.2	10.1	3.5					8.4			2,020	85
	11312	A	1	9.6	34.1	45.8	10.5	3.6					7.7			2,040	85
	11313	A	1	9.7	33.8	46.2	10.3	3.6	5.4	65.2	1.0	14.5	8.1	6,567	11,830		85
			2			37.4	57.2	11.4	4.0	4.8	72.2	1.1	6.5		7,272	13,690	
		3			42.2	57.8		4.5	5.4	81.4	1.3	7.4		8,206	14,770		
¾ mile east of; Hurst No. 1 mine, Jordan bed (face, 100 feet northeast of shaft) Same (face, 350 feet west of shaft) Same (face, 450 feet northeast of shaft) Same (composite of samples 11252 to 11254, inclusive)	11252	A	1	9.3	36.4	41.6	12.7	5.1					7.3			1,960	85
	11253	A	1	11.6	34.0	41.7	12.7	4.0					10.0			1,970	85
	11254	A	1	9.5	34.5	41.9	14.1	3.9					7.9			1,940	85
	11255	A	1	10.1	34.8	41.8	13.3	4.3	5.2	60.9	1.0	15.3	8.4	6,200	11,160		85
			2			38.7	46.5	14.8	4.8	4.5	67.8	1.1	7.0		6,894	12,410	
		3			45.5	54.5		5.7	5.3	70.6	1.3	8.1		8,094	14,570		

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TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate			Ultimate						Calorific value		Softening temperature, °F.	Reference bulletin No.	
	Laboratory No.	Kind	Condition	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Air-drying loss	Calories			British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
LAFAYETTE COUNTY—continued																	
Higginsville, ½ mile south of No. 1 mine, Lexington bed (southeast face, 2,000 feet from shaft) Same (southwest face, 2,000 feet, from hoisting shaft) Same (west face, 1,400 feet from shaft) Same (composite of samples 10239 to 10241, inclusive)	10241	A	1	12.4	34.6	37.2	15.8	4.1					6.5			2,120	22
	10240	A	1	12.3	33.6	33.2	20.9	2.9					6.9			2,000	22
	10239	A	1	12.6	35.1	39.0	13.3	2.9					6.3			2,010	22
	10245	A	1	12.4	34.1	36.8	16.7	2.9	5.6	56.6	.9	17.3	6.6	5,739	10,330		22
				2		39.0	42.0	19.0	3.3	4.8	64.7	1.1	7.1		6,550	11,790	
			3		48.2	51.8		4.1	5.9	79.9	1.3	8.8		8,094	14,570		
Lexington: Graddy mine, Lexington bed (5,000 feet southwest of mine mouth) Same (6,000 feet southeast of mine mouth) Same (5,000 feet east of mine mouth) Same (composite of samples 10225 to 10227, inclusive)	10225	A	1	14.5	33.1	39.7	12.7	3.7					11.1			1,930	22
	10226	A	1	15.1	31.4	39.9	13.6	3.5					10.9			1,990	22
	10227	A	1	14.2	33.4	40.3	12.1	2.9					10.2			2,070	22
	10233	A	1	14.9	31.3	41.0	12.8	3.2	5.6	56.7	1.0	20.7	10.7	5,769	10,370		22
				2		36.7	48.2	15.1	3.8	4.7	66.6	1.2	8.6		6,772	12,190	
			3		43.3	56.7		4.5	5.5	78.4	1.4	10.2		7,978	14,360		
3 miles south of Summit mine, Lexington bed (4,000 feet west of shaft)	75598	B	1	14.5	32.0	37.7	15.8	3.5	4.5	54.5	1.1	20.6	9.9	5,420	9,750	1,950	(31)
			2		37.5	44.0	18.5	5.0	3.4	63.7	1.2	9.1		6,339	11,410		
			3		46.0	54.0			4.2	78.2	1.5	11.1		7,772	13,990		
Napoleon, 1 mile east of Independence mine, Lexington bed (1,400 feet south of hoisting shaft) Same (1,400 feet from shaft) Same (1,200 feet from shaft) Same (composite of samples 10222 to 10224, inclusive)	10222	A	1	13.7	32.2	40.3	13.8	3.1					10.3			1,990	22
	10223	A	1	13.8	32.7	39.3	14.2	3.2					10.2			1,950	22
	10224	A	1	13.5	31.6	39.9	15.0	3.3					9.8			1,990	22
	10232	A	1	13.4	32.0	40.3	14.3	3.1	6.6	55.8	1.0	20.2	10.1	5,683	10,230		22
				2		37.0	46.5	16.5	3.6	4.8	64.5	1.1	9.5		6,567	11,820	
			3		44.3	55.7		4.3	5.7	77.3	1.4	11.3		7,967	14,160		
Waverly, 1½ miles south of Buckhorn mine, Waverly bed (1 west entry, main south entry, 700 feet from shaft) Same (2 east entry, main south entry, 600 feet from shaft)	10340	A	1	11.6	31.6	39.9	16.9	6.0					8.6			1,980	22
	10341	A	1	10.7	32.6	41.3	15.4	7.9					7.7			2,010	22

Sample No.	Location	No.	A	1	12.4	31.9	40.2	15.5	6.8	9.2	2,080	22
10342	Same (main east entry, 1,000 feet from shaft) inclusive	10342	A	1	11.4	33.0	39.8	15.8	6.9	14.7	5,856	22
				2	11.4	33.0	39.8	15.8	6.9	14.7	5,856	22
				3	37.2	45.0	45.0	17.8	7.0	5.2	6,011	22
				3	45.3	54.7	54.7	17.8	7.0	5.2	6,011	22
75567	Same (2,500 feet southwest of shaft)	75567	B	1	11.0	33.3	42.6	13.1	4.9	5.4	8,044	1,900
				2	37.4	47.9	47.9	14.7	3.5	7.2	6,061	1,900
				3	43.9	56.1	56.1	14.7	6.5	8.4	6,806	1,900
				3	43.9	56.1	56.1	14.7	6.5	8.4	6,806	1,900
10228	Wellington, 2½ miles west of Labor Exchange Branch No. 305 mine, Lexington bed (southwest face, 1,200 feet from shaft bottom)	10228	A	1	15.9	32.7	42.5	8.9	2.9	10.9	2,070	22
				1	15.1	32.2	42.8	9.9	3.7	9.2	1,990	22
				1	14.3	33.6	41.4	10.7	2.4	9.9	2,050	22
				1	14.3	33.6	41.4	10.7	2.4	9.9	2,050	22
10230	Same (1,100 feet south of shaft)	10230	A	1	15.3	32.5	42.4	9.8	3.1	10.0	5,978	22
				2	32.3	42.6	42.6	11.6	3.7	8.8	7,056	22
				3	43.4	56.6	56.6	11.6	4.2	9.8	7,978	22
				3	43.4	56.6	56.6	11.6	4.2	9.8	7,978	22
10234	Same (composite of samples 10228 to 10230, inclusive)	10234	A	1	15.3	32.5	42.4	9.8	3.1	10.0	5,978	22
				2	32.3	42.6	42.6	11.6	3.7	8.8	7,056	22
				3	43.4	56.6	56.6	11.6	4.2	9.8	7,978	22
				3	43.4	56.6	56.6	11.6	4.2	9.8	7,978	22
11421	Brookfield, ¾ mile east of Crandall No. 1 mine, Tebo bed (face, 750 feet southeast of shaft)	11421	A	1	14.8	36.6	38.2	10.4	4.6	12.7	2,100	85
				1	14.5	37.0	41.1	7.4	4.3	12.2	1,950	85
				1	15.8	36.2	41.4	6.6	3.8	13.7	2,010	85
				1	15.8	36.2	41.4	6.6	3.8	13.7	2,010	85
11423	Same (face, 800 feet east of shaft)	11423	A	1	15.1	36.1	40.6	8.2	4.2	12.9	6,100	85
				2	42.5	47.9	47.9	9.6	5.0	7.8	7,183	85
				3	47.0	53.0	53.0	9.6	5.5	8.8	7,950	85
				3	47.0	53.0	53.0	9.6	5.5	8.8	7,950	85
11424	Same (composite of samples 11421 to 11423, inclusive)	11424	A	1	15.1	36.1	40.6	8.2	4.2	12.9	6,100	85
				2	42.5	47.9	47.9	9.6	5.0	7.8	7,183	85
				3	47.0	53.0	53.0	9.6	5.5	8.8	7,950	85
				3	47.0	53.0	53.0	9.6	5.5	8.8	7,950	85
11413	3 miles southeast of Walker No. 1 mine, Tebo bed (face, 250 feet southwest of shaft)	11413	A	1	14.1	36.7	40.4	8.8	4.4	11.8	2,200	85
				1	15.1	36.8	42.4	5.7	3.8	12.7	1,930	85
				1	15.5	35.9	40.5	8.1	4.9	13.3	2,000	85
				1	15.5	35.9	40.5	8.1	4.9	13.3	2,000	85
11415	Same (face, 200 feet southeast of shaft)	11415	A	1	14.9	36.4	41.3	7.4	4.1	12.6	6,178	85
				2	42.8	48.5	48.5	8.7	4.9	8.5	7,261	85
				3	46.8	53.2	53.2	8.7	5.3	9.3	7,956	85
				3	46.8	53.2	53.2	8.7	5.3	9.3	7,956	85
11416	Same (composite of samples 11413 to 11415, inclusive)	11416	A	1	14.9	36.4	41.3	7.4	4.1	12.6	6,178	85
				2	42.8	48.5	48.5	8.7	4.9	8.5	7,261	85
				3	46.8	53.2	53.2	8.7	5.3	9.3	7,956	85
				3	46.8	53.2	53.2	8.7	5.3	9.3	7,956	85
11417	Marceline, ¾ mile west of Landreth No. 1 mine, Tebo bed (face, 600 feet east of shaft)	11417	A	1	13.0	38.4	41.5	7.1	4.1	10.9	1,990	85
				1	12.1	38.5	41.0	8.4	4.5	10.0	1,900	85
				1	12.7	39.6	40.9	6.8	4.1	10.4	2,040	85
				1	12.7	39.6	40.9	6.8	4.1	10.4	2,040	85
11419	Same (face, 600 feet north of shaft)	11419	A	1	12.5	39.3	40.8	7.4	4.3	10.4	6,378	85
				2	44.9	46.6	46.6	8.5	4.9	8.3	7,294	85
				3	49.1	50.9	50.9	8.5	5.3	9.1	7,967	85
				3	49.1	50.9	50.9	8.5	5.3	9.1	7,967	85
11420	Same (composite of samples 11417 to 11419, inclusive)	11420	A	1	12.5	39.3	40.8	7.4	4.3	10.4	6,378	85
				2	44.9	46.6	46.6	8.5	4.9	8.3	7,294	85
				3	49.1	50.9	50.9	8.5	5.3	9.1	7,967	85
				3	49.1	50.9	50.9	8.5	5.3	9.1	7,967	85
75565	Macon County Ardmore, 1 mile north of Central No. 24 mine, Bevier bed (4,000 feet southeast of shaft)	75565	B	1	13.3	33.9	42.0	10.8	4.5	17.2	6,006	(31)
				2	39.0	48.6	48.6	12.4	5.2	6.1	6,933	(31)
				3	44.7	55.3	55.3	6.0	5.3	7.1	7,917	(31)
				3	44.7	55.3	55.3	6.0	5.3	7.1	7,917	(31)
1226	Bevier, 1 mile south of No. 8 mine, Bevier bed (1 east entry, north side)	1226	A	1	14.7	38.5	39.0	7.8	3.8	6.2	6,611	22
				2	45.2	45.7	45.7	9.1	4.5	5.0	7,289	22
				1	12.9	36.5	39.9	10.7	3.8	5.0	13,190	22
				2	42.0	42.0	42.0	12.2	4.4	5.0	13,190	22
1227	Same (2 west entry, south side)	1227	A	1	14.7	38.5	39.0	7.8	3.8	6.2	6,611	22
				2	45.2	45.7	45.7	9.1	4.5	5.0	7,289	22
				1	12.9	36.5	39.9	10.7	3.8	5.0	13,190	22
				2	42.0	42.0	42.0	12.2	4.4	5.0	13,190	22

TABLE 4.—*Chemical analyses of mine samples—Continued*

Locality, mine, etc.	Sample			Proximate				Ultimate				Calorific value		Softening temperature, °F.	Ref-er-ence bulletin No.		
	Lab-oratory No.	Kind	Con-di-tion	Mois-ture	Vola-tile car-bon	Fixed car-bon	Ash	Sul-phur	Hy-dro-gen	Car-bon	Ni-tro-gen	Oxy-gen	Air dry-ing loss			Calo-ries	British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
MACON COUNTY—continued																	
Bevier, 1½ miles southeast of; No. 9 mine, Bevier bed (east face, 2,200 feet from shaft) Same (south face, 1,700 feet from shaft) Same (1,300 feet north and 400 feet west of shaft) Same (composite of sample 9988 to 9990, inclusive)	9988	A	1	16.2	33.0	42.5	8.3	3.5					10.3			1,920	22
	9989	A	1	17.0	33.3	39.0	10.7	3.5					12.1			1,990	22
	9990	A	1	16.3	34.7	40.2	8.8	3.2					11.3			1,940	22
	9991	A	1	16.3	33.4	40.9	9.4	3.4	5.8	58.3	1.1	22.0	11.2	5,906	10,630		22
			2		39.9	48.9	11.2	4.1	4.7	69.6	1.3	9.1		7,050	12,690		22
2½ miles south of; Central No. 61 mine, Bevier bed (4,000 feet south of shaft) Same (2,500 feet west of shaft) Same (east main entry, 3,500 feet from shaft) Same (10 east entry, main north entry, 4,000 feet from shaft) Same (main south entry, 4,500 feet from shaft) Same (composite of samples 10191 to 10193, inclusive)	4196	A	1	15.3	33.9	42.1	8.7	4.4					8.5				22
	4197	A	2	15.4	32.9	40.2	11.6	3.8					8.8	5,878	10,580		22
	10191	A	2	15.4	38.7	47.6	13.7	4.5					8.8	6,950	12,510		22
	10192	A	1	14.0	35.2	42.0	8.8	2.7					8.9			2,070	22
	10193	A	1	13.0	35.3	41.0	10.7	4.4					8.3			2,060	22
Macon, east edge of town; Home mine, Mulky bed (west face, 80 feet from shaft) Same (east face, 80 feet from shaft) Same (composite of samples 9985 and 9986)	10201	A	1	13.8	34.7	41.8	9.7	3.3	5.7	59.8	1.1	20.4	8.7	6,089	10,990		22
		2			40.3	48.4	11.3	3.3	4.9	69.4	1.2	9.3		7,007	12,720		22
		3			45.4	54.6		4.3	5.5	78.3	1.4	10.5		7,967	14,340		22
	9985	A	1	12.0	40.6	39.1	8.3	2.6					7.9			1,950	22
	9986	A	1	14.4	38.8	36.9	9.9	4.5					9.6			2,100	22
MILLER COUNTY																	
Barnett (Morgan County), 6 miles northeast of; (left side of prospect pit, a pocket bed)	1446	A	1	13.3	37.7	42.1	6.9	5.1					7.4	6,450	11,610		22
		2			43.6	48.5	8.0	5.8						7,439	13,390		22

Sample	1447	A	1	2	10.6	41.1	42.1	6.2	5.0	6.0	1,900	85				
PUTNAM COUNTY																
Mendota, 1 mile southeast of; Mendota No. 2 mine, Lexington bed (face, 2,500 feet southwest of shaft).....	11398	A	1	18.6	31.9	40.0	9.5	4.3	15.1	1,900	85					
Same (face, 3,200 feet south of shaft).....	11399	A	1	17.5	34.1	38.9	8.5	3.7	14.3	1,940	85					
Same (face, 3,100 feet southeast of shaft).....	11400	A	1	19.1	31.5	37.9	11.5	4.3	16.1	1,940	85					
Same (composite of samples 11398 to 11400, inclusive).....	11401	A	1	18.5	32.6	39.0	9.9	4.1	5.8	55.7	9	23.6	15.2	5,578	10,040	85
			2	40.0	47.9	42.1	12.1	4.0	4.6	68.3	1.1	8.9	6,839	12,310	85	
			3	45.5	54.5	54.5	5.7	5.2	77.8	1.3	10.0	7,783	14,010	85		
Unionville, 2½ miles northeast of; Anderson mine, Lexington bed (in mine, about 175 feet southwest of shaft).....	*14880	B	1	16.5	34.4	37.3	11.8	3.4	12.8	5,600	10,080	2,100	85			
			2	41.2	44.1	44.1	14.1	4.1	6,706	12,070	85					
			3	10.5	34.8	37.4	11.3	2.9	12.8	5,561	10,010	2,030	85			
Same (about 150 feet east of shaft).....	*14881	B	2	41.6	44.8	44.8	13.6	3.5	6,667	12,000	85					
RANDOLPH COUNTY																
Higbee; No. 7 mine, Bevier bed (3,400 feet northwest of shaft).....	2795	A	1	13.4	34.2	42.4	10.0	4.5	10.8	6,156	11,080	22				
			2	39.5	48.9	48.9	11.6	5.2	7,111	12,800	22					
Same (5,000 feet north of shaft).....	2796	A	2	13.9	33.4	41.2	11.5	4.2	11.5	11.5	1,980	85				
			2	38.7	47.9	47.9	13.4	4.9	11.5	11.6	1,980	85				
Huntsville, southern part of; Carson No. 1 mine, Bevier bed (face, 250 feet southeast of shaft).....	11452	A	1	13.4	35.1	41.2	10.3	5.6	11.5	11.5	1,980	85				
Same (face, 300 feet north of shaft).....	11453	A	1	13.4	34.8	42.0	9.8	5.2	11.5	11.5	1,970	85				
Same (face, 200 feet southwest of shaft).....	11454	A	1	13.3	34.7	41.7	10.3	5.1	11.6	11.6	1,980	85				
Same (composite of samples 11452 to 11454, inclusive).....	11455	A	1	13.2	35.0	41.5	10.3	5.2	5.6	60.3	9	17.7	11.5	6,100	10,980	85
			2	40.3	47.9	47.9	11.8	6.0	4.7	69.4	1.1	7.0	7,033	12,660	85	
			3	45.7	54.3	54.3	6.8	5.4	78.7	1.2	7.9	7,972	14,350	85		
¾ mile south of; Northern No. 2 mine, Bevier bed (face, 4,000 feet south of shaft).....	11448	A	1	12.5	36.9	42.8	7.8	3.0	10.6	10.6	1,900	85				
Same (face, 3,800 feet northeast of shaft).....	11449	A	1	13.0	35.8	41.8	9.4	4.3	11.2	11.2	1,900	85				
Same (face, 3,500 feet southeast of shaft).....	11450	A	1	10.5	36.5	43.9	9.1	4.5	8.4	8.4	1,990	85				
Same (composite of samples 11448 to 11450, inclusive).....	11451	A	1	12.1	36.3	42.9	8.7	3.9	5.6	63.3	1.0	17.5	10.1	6,361	11,450	85
			2	41.3	48.8	48.8	9.9	4.5	4.8	72.1	1.2	7.5	7,239	13,030	85	
			3	45.9	54.1	54.1	5.0	5.3	80.0	1.3	8.4	8,033	14,460	85		
1 mile east of; No. 3 mine, Bevier bed (900 feet north of shaft).....	2817	A	1	14.0	33.5	42.2	10.3	5.2	11.8	6,128	11,030	22				
			2	39.0	49.0	49.0	12.0	6.1	7,128	12,830	22					
Same (4,000 feet southwest of shaft).....	2818	A	2	11.4	37.1	43.0	8.5	3.6	8.6	8.6	1,900	85				
			2	41.9	48.6	48.6	9.5	4.0	11.8	11.8	1,990	85				
2 miles east of; Powhatan mine, Bevier bed (1,500 feet northeast of slope mouth).....	75560	B	1	15.1	33.4	40.3	11.2	3.8	5.6	58.8	1.0	19.6	11.4	5,883	10,590	(31)
			2	39.3	47.5	47.5	13.2	4.5	4.7	69.2	1.1	7.3	6,928	12,470	85	
			3	45.3	54.7	54.7	5.2	5.4	79.7	1.3	8.4	7,978	14,360	85		
Jacksonville, 1 mile northwest of; Jacksonville mine, Bevier bed (2,500 feet northwest of shaft).....	75569	B	1	13.4	34.1	38.8	13.7	6.0	5.5	56.2	1.0	17.6	9.8	5,728	10,310	(32)
			2	39.2	44.9	44.9	15.9	7.0	4.6	65.0	1.2	6.3	6,617	11,910	85	
			3	46.7	53.3	53.3	8.3	5.4	77.2	1.4	7.7	7,967	14,160	85		

TABLE 4.—Chemical analyses of mine samples—Continued

Locality, mine, etc.	Sample			Proximate			Ultimate						Calorific value		Softening temperature, °F.	Ref-er-ence bulletin No.	
	Lab-oratory No.	Kind	Con-dition	Mois-ture	Vola-tile matter	Fixed car-bon	Ash	Sul-phur	Hy-dro-gen	Car-bon	Ni-tro-gen	Oxy-gen	Air dry-ing loss	Calo-rics			British thermal units
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
RANDOLPH COUNTY—continued																	
Moberly, 1½ miles northwest of Smith-Marriott mine, Beaver bed (200 feet east of shaft).....	75564	B	1	13.3	35.0	39.5	12.2	4.8	5.5	58.3	0.9	18.3	9.2	5,818	10,470	1,940	(32)
			2	.....	40.4	45.5	14.1	5.6	4.7	67.3	1.1	7.2	.....	6,711	12,060	.....	
			3	.....	47.0	53.0	.....	6.5	5.4	78.3	1.3	8.5	.....	7,811	14,060	.....	
Renick, ¼ mile west of; Orris No. 1 mine, Mulky bed (face, 300 feet southwest of shaft).....	11407	A	1	9.8	38.2	43.0	9.0	4.7	.....	.....	.....	.....	7.9	.....	.....	1,920	85
Same (face, 300 feet northwest of shaft).....	11498	A	1	7.4	41.1	43.6	7.9	4.0	.....	.....	.....	.....	5.1	.....	.....	1,950	85
Same (face, 300 feet west of shaft).....	11499	A	1	8.8	39.8	42.9	8.5	5.4	.....	.....	.....	.....	6.7	.....	.....	1,870	85
Same (composite of samples 11497 to 11499, inclusive).....	11500	A	1	8.7	39.9	42.9	8.5	4.6	5.6	66.1	0	14.3	6.6	6,706	12,070	.....	85
			2	.....	43.7	46.0	9.4	5.1	5.1	72.4	1.0	7.0	.....	7,334	13,230	.....	
			3	.....	48.2	51.8	.....	5.6	5.6	78.8	1.1	7.9	.....	8,106	14,530	.....	
Ryder, 4 miles east of Higbee; Jones No. 1 mine, Beaver bed (southwest face, 75 feet from hoisting shaft).....	10180	A	1	12.1	32.7	40.0	15.2	4.7	.....	.....	.....	.....	6.7	.....	.....	1,890	22
Same (main entry, 75 feet southwest of shaft bottom).....	10181	A	1	12.1	32.7	40.5	14.7	4.9	.....	.....	.....	.....	6.7	.....	.....	1,830	22
Same (60 feet southwest of shaft bottom).....	10182	A	1	11.7	34.3	41.6	12.4	4.2	.....	.....	.....	.....	6.4	.....	.....	1,910	22
Same (composite of samples 10180 to 10182, inclusive).....	10183	A	1	11.6	32.6	41.7	14.1	4.7	5.4	58.5	1.0	16.3	6.6	6,030	10,870	.....	22
			2	.....	36.9	47.2	15.9	5.3	4.7	66.2	1.1	6.8	.....	6,833	12,300	.....	22
			3	.....	43.9	56.1	.....	6.3	5.6	78.7	1.3	8.1	.....	8,128	14,630	.....	22
RAY COUNTY																	
Camden, No. 2 mine, Lexington bed (1,000 feet west of shaft).....	10206	A	1	16.1	32.0	41.5	10.4	2.9	.....	.....	.....	.....	12.1	.....	.....	.....	22
Same (800 feet west of shaft).....	10207	A	1	16.3	33.1	40.5	10.1	2.7	.....	.....	.....	.....	10.4	.....	.....	.....	22
Same (1,200 feet west of shaft).....	10208	A	1	16.0	33.3	40.9	9.8	2.9	.....	.....	.....	.....	9.9	.....	.....	.....	22
Same (composite of samples 10206 to 10208, inclusive).....	10217	A	1	16.8	32.8	41.5	9.9	3.0	6.8	58.6	1.1	21.6	10.8	5,900	10,020	.....	22
			2	.....	30.0	49.2	11.8	3.5	4.8	69.7	1.3	8.9	.....	7,011	12,020	.....	22
			3	.....	44.2	55.8	.....	4.0	5.5	78.9	1.5	10.1	.....	7,944	14,300	.....	22
Richmond, No. 50 mine, Lexington bed (100 feet north of shaft).....	10194	A	1	14.1	34.4	39.6	11.9	4.0	.....	.....	.....	.....	9.7	.....	.....	2,030	22
Same (100 feet north of shaft).....	10195	A	1	13.7	34.8	40.1	11.4	3.5	.....	.....	.....	.....	8.5	.....	.....	2,010	22
Same (125 feet east of shaft).....	10196	A	1	13.6	34.6	40.5	11.3	4.1	.....	.....	.....	.....	9.3	.....	.....	1,990	22

Same (composite of samples 10194 to 10196, inclusive).....	10200	A	1	13.6	34.3	40.6	11.6	3.8	5.7	58.2	1.0	19.8	0.2	5,983	10,770	22
			2	39.7	47.0	13.8	4.4	4.8	67.8	1.2	9.0	-----	-----	6,922	12,460	-----
			3	-----	45.8	54.2	-----	5.0	5.5	77.6	1.4	10.6	-----	7,983	14,370	-----
1 mile northeast of; Ray County mine, Lexington bed (1,300 feet south of shaft).....	75563	B	1	14.6	33.5	36.2	12.7	4.0	5.6	56.9	1.0	19.8	7.9	5,789	10,420	(32)
			2	-----	39.2	46.0	14.8	4.7	4.7	66.6	1.2	8.0	-----	6,783	12,210	-----
			3	-----	46.1	53.9	-----	5.6	5.5	78.2	1.4	9.3	-----	7,907	14,340	-----
3 miles southwest of; No. 2 mine, Lexington bed (800 feet north of shaft).....	10197	A	1	14.9	32.8	40.3	12.0	3.5	-----	-----	-----	-----	10.2	-----	2,040	22
Same (face of east entry, 400 feet from shaft bottom).....	10198	A	1	14.6	31.7	40.9	12.8	3.5	-----	-----	-----	-----	10.8	-----	2,140	22
Same (composite of samples 10197 to 10199, inclusive).....	10199	A	1	14.1	31.8	38.3	15.8	4.6	-----	-----	-----	-----	10.3	-----	1,930	22
			2	14.6	31.3	40.5	13.6	3.8	5.6	56.0	1.0	20.0	10.4	5,683	10,230	22
			3	-----	43.6	56.4	-----	5.2	5.6	78.1	1.4	9.7	-----	6,656	11,980	-----
Vibbard, 1/4 mile south of; Vibbard No. 1 mine, Lexington bed (face of entry, 250 feet south of shaft).....	11365	A	1	11.9	38.0	42.7	7.4	3.0	-----	-----	-----	-----	7.2	-----	1,900	85
Same (face of entry, 200 feet east of shaft).....	11366	A	1	13.6	36.6	43.7	6.1	2.2	-----	-----	-----	-----	8.4	-----	2,220	85
Same (face of entry, 200 feet west of shaft).....	11367	A	1	13.8	36.5	42.6	7.1	3.0	-----	-----	-----	-----	9.2	-----	1,900	85
Same (composite of samples 11365 to 11367, inclusive).....	11368	A	1	13.1	36.9	43.2	6.8	2.8	6.7	64.2	1.0	19.5	8.3	6,417	11,550	85
			2	-----	42.5	49.6	7.9	3.2	4.9	73.9	1.1	9.0	-----	7,383	13,290	-----
			3	-----	46.1	53.9	-----	3.5	5.3	80.2	1.2	9.8	-----	8,011	14,420	-----
SULLIVAN COUNTY																
Milan (Polk Township), 1/4 mile west of; No. 1 mine, Beaver bed (500 feet southeast of shaft).....	10125	A	1	13.7	33.0	39.5	13.8	5.6	-----	-----	-----	-----	7.3	-----	1,850	22
Same (600 feet south of hoisting shaft).....	10126	A	1	13.5	31.5	35.1	19.9	6.3	-----	-----	-----	-----	8.4	-----	1,900	22
Same (composite of samples 10125 and 10126).....	10143	A	2	13.1	32.2	37.0	17.1	3.9	5.4	53.4	9	17.3	8.4	5,500	9,900	22
			3	-----	37.1	43.2	19.7	8.5	4.5	61.4	1.1	6.5	-----	6,328	11,390	-----
				-----	46.2	53.8	-----	-----	5.6	70.5	1.3	8.1	-----	7,878	14,180	-----
VERNON COUNTY																
Moundville, northwest corner of; Brown No. 1 mine (face of entry, 40 feet northwest of shaft).....	11201	A	1	5.7	33.7	50.0	10.6	5.0	-----	-----	-----	-----	4.2	-----	2,040	85
Same (face of entry, 100 feet northeast of shaft).....	11202	A	1	6.0	33.1	52.5	8.4	3.9	-----	-----	-----	-----	4.6	-----	2,010	85
Same (face of entry, 125 feet north of shaft).....	11203	A	1	7.9	30.1	51.0	11.0	5.9	-----	-----	-----	-----	6.6	-----	2,080	85
Same (composite of samples 11201 to 11203, inclusive).....	11204	A	1	6.5	32.6	50.8	10.1	5.0	5.2	68.0	1.1	10.6	5.1	6,922	12,460	85
			2	-----	34.9	54.3	10.8	5.3	4.8	72.7	1.2	5.2	-----	7,400	13,320	-----
			3	-----	39.1	60.9	-----	5.9	5.4	81.5	1.3	5.9	-----	8,294	14,930	-----
Panama, 2 miles south of; Jones No. 1 mine, Rich Hill bed (face of entry, 450 feet east of shaft).....	11205	A	1	6.2	35.4	42.9	15.5	5.5	-----	-----	-----	-----	5.0	-----	1,930	85
Same (face of entry, 1,000 feet southeast of shaft).....	11206	A	1	6.5	34.4	43.6	15.5	5.9	-----	-----	-----	-----	4.7	-----	1,990	85
Same (face of entry, 100 feet east of shaft).....	11207	A	1	5.2	36.7	45.5	12.6	5.9	-----	-----	-----	-----	3.6	-----	1,980	85
Same (composite of samples 11205 to 11207, inclusive).....	11208	A	1	6.0	35.9	43.4	14.7	5.8	5.3	63.6	1.0	9.6	4.4	6,578	11,840	85
			2	-----	38.2	46.2	15.6	6.2	4.9	67.6	1.1	4.6	-----	7,000	12,600	-----
			3	-----	45.3	54.7	-----	7.4	5.8	80.1	1.3	5.4	-----	8,294	14,930	-----

DESCRIPTION OF SAMPLES

ADAIR COUNTY

KIRKSVILLE. BIG CREEK No. 1 MINE

Analysis 75558 (p. 10). Bituminous coal from Big Creek No. 1 mine, a shaft mine, at Kirksville on the Wabash Railway and the Quincy, Omaha & Kansas City Railroad. Coal bed, Bevier; Cherokee formation. Thickness, 3 feet 8 inches. Roof, sandy shale; floor, clay. The bed was measured and sampled at one point, by W. W. Weigel, as described below:

Section of coal bed in Big Creek No. 1 mine

Laboratory No.	75558
Roof, sandy shale:	Ft. in.
Coal.....	2 10
Clay and pyrite.....	" 2
Coal.....	8
Floor, clay:	
Thickness of bed.....	3 8
Thickness of sample.....	3 6

The daily output was 800 tons at the time of sampling.

NOVINGER. ELECTRIC MINE

Analysis 75561 (p. 11). Bituminous coal from Electric mine, 2 miles west of Novinger. Coal bed, Bevier; Cherokee formation. Thickness, 3 feet 8½ inches. Roof, shale, "slaty" and variable; floor, hard fire clay. The bed was measured and sampled at one point, 2,500 feet west of shaft, June 7, 1920, by W. W. Weigel, as described below:

Section of coal bed in Electric mine

Laboratory No.	75561
Roof, shale, "slaty and" variable:	Ft. in.
Coal containing thin pyrite lenses and nodules.....	2
Clay, hard and pyritiferous.....	" ½
Coal.....	5
Clay, hard.....	" 2
Coal.....	1 1
Floor, clay, hard fire clay:	
Thickness of bed.....	3 8½
Thickness of sample.....	3 6

The daily output was 150 tons at the time of sampling.

NOVINGER. KANSAS CITY MIDLAND No. 4 MINE

Analysis 75566 (p. 11). Bituminous coal from Kansas City Midland No. 4 mine, 3 miles southwest of Novinger. Coal bed, Bevier; Cherokee formation. Thickness, 3 feet 7½ inches. Roof, weak shale; floor, hard clay. The bed was measured at one point, 3,500 feet east of shaft, June 8, 1920, as described below:

* Not included in sample.

Section of coal bed in Kansas City Midland No. 4 mine

Laboratory No.....	75566
Roof, weak shale:	Ft. in.
Coal, pyrite lenses.....	1 11
Clay, hard, and much pyrite.....	• 1½
Coal.....	5
Clay, hard.....	• 2
Coal.....	1 0
Floor, hard clay:	
Thickness of bed.....	3 7½
Thickness of sample.....	3 4
The daily output was 750 tons at time of sampling.	

BARTON COUNTY**MULBERRY. CARNEY-CHEROKEE No. 2 MINE**

Analysis 75557 (p. 12). Bituminous coal from Carney-Cherokee No. 2 mine, 2½ miles northeast of Mulberry, Kans. Coal bed, Weir-Pittsburg lower bed; Cherokee formation. Thickness, 2 feet 9 inches. Roof, shale; floor, clay, hard fire clay. The bed was sampled at one point, July 20, 1920, as described below:

Section of coal bed in Carney-Cherokee mine

Laboratory No.....	75557
Roof, shale:	Ft. in.
Coal, thin shale streaks with pyrite streaks near top.....	1 5
Clay.....	• 1
Coal.....	1 3
Floor, clay, hard fire clay:	
Thickness of bed.....	2 9
Thickness of sample.....	2 8
The daily output was 150 tons at time of sampling.	

BATES COUNTY**FOSTER. WALNUT MINE**

Analyses A-2815 to A-2817 (p. 13). Bituminous coal from Walnut mine, a drift mine, 2 miles southwest of Foster on the Missouri Pacific Railroad. Coal bed, Mulberry; Pleasanton formation. Thickness, 3 feet 1 inch to 3 feet ½ inch. Roof, hard blue shale; floor, fire clay. Dip, 1°. The bed was measured at two points, June 4, 1924, by J. N. Geyer, as described below:

Sections of coal bed in Walnut mine

Section.....	A A-2815		B A-2816	
Laboratory No.....				
Roof, hard shale:	Ft. in.		Ft. in.	
Coal, lustrous.....	1	2	1	3
Pyrite and "sulphur".....	• 1½		• 1	
Pyrite.....			• 1	
Coal, dull, laminated.....	1	6½	1	3½
"Blackjack".....	• 3		• 5	
Floor, fire clay:				
Thickness of bed.....	3	1	3	½
Thickness of sample.....	2	8½	2	6½

•Not included in sample.

Section A was measured at face of 1 south entry 500 feet southeast of opening; and section B was measured at face of main east entry, 500 feet east of opening. The ultimate analysis of a composite sample, made by combining face samples A2815 and A2816, is given under laboratory number A2817.

Coal was undercut by hand; FF black powder was used. The mining system was room and pillar. At the time of sampling the daily output was 50 tons; the output for 1923 was 9,000 tons. All coal was from advance workings and was run of mine. Bar screens were used and coal was picked on car. In 1924 the lifetime of the mine was estimated to be 15 years.

HUME. N. & S. MINE

Analyses A-1959 to A-1961 (p. 13). Bituminous coal from N. & S. mine, a stripping operation, $3\frac{1}{2}$ miles north of Hume on the Kansas City Southern Railway. Coal bed, Mulberry; Cherokee formation. Thickness, 2 feet 5 inches to 2 feet 8 inches. Roof, "soapstone"; floor, fire clay. The bed was measured at two points, May 21, 1924, by J. N. Geyer, as described below:

Sections of coal bed in N. & S. mine

Section.....	A		B	
Laboratory No.....	A-1959		A-1960	
Roof, soapstone:	<i>Pt.</i>	<i>in.</i>	<i>Pt.</i>	<i>in.</i>
Coal.....		11		10
Pyrite.....		• 1		• 2
Coal.....	1	8	1	5
Floor, fire clay:				
Thickness of bed.....	2	8	2	5
Thickness of sample.....	2	7	2	3

• Not included in sample.

Section A was measured at the loading shovel in pit; and section B was measured 200 feet ahead of the loading shovel in pit. The ultimate analysis of a composite sample, made by combining face samples A-1959 and A-1960, is given under laboratory number A-1961.

A steam shovel was used for stripping; black powder and dynamite were used for blasting. At the time of sampling the daily output was 750 tons; the output for 1923 was 72,000 tons. Shaker screens were used; coal was taken from advance workings, 60 per cent being run of mine. At the time of sampling this mine was the only one in the vicinity that cleaned its coal on a table.

WORLAND. VALENTINE MINE

Analyses A-1838 to A-1840 (pp. 14-15). Bituminous coal from Valentine mine, a stripping operation, at Worland on the Kansas City Southern Railway. Coal bed, Mulberry; Cherokee formation. Dip, flat. Thickness, 2 feet $5\frac{1}{2}$ inches to 2 feet 8 inches. Roof, soft "soapstone"; floor, fire clay. The bed was measured at two points, May 16, 1924, by J. N. Geyer, as described below:

Sections of coal bed in Valentine mine

Section.....	A	B
Laboratory No.....	A-1838	A-1839
Roof, soft "soapstone":		
Coal.....	<i>Ft. in.</i>	<i>Ft. in.</i>
Pyrite.....	8	2 8
Coal.....	1 8½	
Floor, fire clay:		
Thickness of bed.....	2 5½	2 8
Thickness of sample.....	2 4½	2 8

* Not included in sample.

Section A was measured 20 feet ahead of loading shovel in pit; and section B was measured in McGoey's pit on Franklin farm. The ultimate analysis of a composite sample, made by combining samples A-1838 and A-1839, is given under laboratory number A-1840.

A steam shovel was used for stripping the coal. Blasting was done with black powder and dynamite. At the time of sampling the daily output was 250 tons; shaker screens were used; sizes produced were run of mine, slack, crushed, egg, and lump. A new tippie was to be built and a picking table installed. In 1924 the lifetime of the mine was estimated at 100 years.

WORLAND. BLUE JAY MINE

Analyses A-1841 to A-1844 (p. 15). Bituminous coal from the Blue Jay mine, a slope mine, one-fourth mile north of Worland on the Kansas City Southern Railway. Coal bed, Mulberry; Cherokee formation; dip 1°; strike northeast. Thickness, 2 feet ¼ inch to 2 feet 9½ inches. Roof, soft "soapstone"; floor, fire clay. The bed was measured at three places, May 16, 1924, by J. N. Geyer, as described below:

Sections of coal bed in Blue Jay mine

Section.....	A	B	C
Laboratory No.....	A-1841	A-1842	A-1843
Roof, soft "soapstone":			
Coal.....	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>
Pyrite.....	11	2 8½	2 9½
Coal.....	1 0		
Coal.....	1 11		
Thickness of bed.....	2 ¼	2 8½	2 9½
Thickness of sample.....	1 11	2 8½	2 9½

* Not included in sample.

Section A was measured at face of 3 west entry, off south entry, 1,500 feet southeast of opening; section B was measured at face of 1 north entry, off 1 east entry, 1,500 feet east of opening; and section C was measured at face of 2 east entry, 2,200 feet southeast of opening. The ultimate analysis of a composite sample, made by combining face samples A-1841, A-1842, and A-1843, is given under laboratory number A-1844.

The daily output was 200 tons; the output in 1923 was 35,000 tons. Shaker screens were used; all coal was run of mine. Coal was undercut by machines; black powder and permissible explosives were used.

BOONE COUNTY**COLUMBIA. BLACKFOOT MINE**

Analysis 75556 (p. 15). Bituminous coal from Blackfoot mine, a shaft mine, 2 miles south of Columbia on the Wabash Railway and the Missouri, Kansas & Texas Railway. Coal bed, Bevier; Cherokee formation. Thickness, 3 feet 8 inches. Roof, shale; floor, clay and limestone. The bed was measured at one point, May 31, 1920, by W. W. Weigel, as described below:

Sections of coal bed in Blackfoot mine

Laboratory No.	75556
Roof, shale:	Ft. in.
Coal	2 10
Clay	2
Coal	8
Floor, clay and limestone:	
Thickness of bed	3 8
Thickness of sample	3 9
The bed was measured 500 feet west of shaft.	
The daily output 100 tons at time of sampling.	

CALLAWAY COUNTY**FULTON. GRENNEL MINE**

Analysis 75562 (p. 16). Bituminous coal, from Grennel mine, 1½ miles southwest of Fulton. Coal bed, Bevier; Cherokee formation. Thickness, 2 feet 6 inches. Roof, shale; floor, clay with hard and soft layers. The bed was sampled 200 feet southwest of the shaft, July 17, 1920, by W. W. Weigel.

The daily output was 25 tons at time of sampling.

HENRY COUNTY**WINDSOR. BOWEN MINE**

Analyses 75554 and 75555 (p. 19). Bituminous and cannel coal from Bowen mine, a shaft mine, 7 miles northwest of Windsor, on the Missouri, Kansas & Texas Railway and Chicago, Rock Island & Pacific Railroad. Coal bed, Windsor; Cherokee formation. Thickness of clean coal, 6 feet 6 inches. Roof, "rash" (thin coal with clay and pyrite seams); floor, shale and clay. The bed was measured at two points, July 23, 1920, by W. W. Weigel, as described below:

Sections of coal bed in Bowen mine

Section	A 75554	B 75555
Laboratory No.		
Roof:	Ft. in.	Ft. in.
Black shale	5 0	5 0
Coal with some pyrite streaks near base	6 5	6 5
Immediate roof, rash (thin coal with clay and pyrite seams):		
Coal, bituminous	4 0	4 0
Coal, cannel	4 0	4 0
Floor, shale, and clay:		
Thickness of bed	6 6	6 6
Thickness of sample	4 0	2 6

The daily output was 400 tons at time of sampling.

• Not included in sample.

LAFAYETTE COUNTY**LEXINGTON. SUMMIT MINE**

Analysis 75568 (p. 20). Bituminous coal from Summit mine, 3 miles south of Lexington. Coal bed, Lexington; Cherokee formation. Thickness, 1 foot 7 inches. Roof, shale overlaid with limestone; floor, clay. The bed was measured and sampled 4,000 feet west of shaft May 6, 1920, by W. W. Weigel.

The daily output was 400 tons at time of sampling.

MACON COUNTY**ARDMORE. CENTRAL NO. 24**

Analysis 75565 (p. 21). Bituminous coal from Central No. 24 mine, 1 mile north of Ardmore. Coal bed, Bevier; Cherokee formation. Thickness 4 feet 4 inches. Roof, shale and sandstone; floor, fire clay and limestone. The bed was measured and sampled at one point, 4,000 feet southeast of shaft, May 29, 1920, by W. W. Weigel, as described below:

Section of coal bed in Central No. 24 mine

Laboratory No.....	75565
Roof, shale and sandstone:	Ft. in.
Coal.....	3 2
Shale and pyrite.....	" 2
Coal.....	1 0
Floor, fire clay, and limestone:	
Thickness of bed.....	4 4
Thickness of sample.....	4 2

The daily output was 850 tons at time of sampling.

RANDOLPH COUNTY**HUNTSVILLE. POWHATAN MINE**

Analysis 75560 (p. 23). Bituminous coal from Powhatan mine, a slope mine 2 miles east of Huntsville. Coal bed, Bevier; Cherokee formation. Thickness, 4 feet 1 inch. Roof, sandy shale; floor, hard fire clay. The bed was sampled at one point 1,500 feet northeast of slope mouth, June 12, 1920 by W. W. Weigel as described below:

Section of coal bed in Powhatan mine

Laboratory No.....	75560
Roof, sandy shale:	Ft. in.
Coal.....	3 0
Clay, hard and pyritiferous.....	" 5
Coal.....	8
Floor, hard fire clay:	
Thickness of bed.....	4 1
Thickness of sample.....	3 8

The daily output was 450 tons at time of sampling.

* Not included in sample.

JACKSONVILLE. JACKSONVILLE MINE

Analysis 75569 (p. 23). Bituminous coal from Jacksonville mine, 1 mile northwest of Jacksonville. Coal bed, Bevier; Cherokee formation. Thickness, 3 feet 11 inches. Roof, shale; floor, clay. The bed was sampled at one point, 2,500 feet northwest of shaft, June 11, 1920, by W. W. Weigel, as described below:

Section of coal bed in Jacksonville mine

Laboratory No.....	75569
Roof, shale:	Ft. in.
Coal.....	2 10
Clay.....	• 3
Coal.....	10
Floor, clay:	
Thickness of bed.....	3 11
Thickness of sample.....	3 8

The daily output was 200 tons at time of sampling.

MOBERLY. SMITH-MARRIOTT MINE

Analysis 75564 (p. 24). Bituminous coal, from Smith-Marriott mine, 1½ miles northwest of Moberly. Coal bed, Bevier; Cherokee formation. Thickness, 4 feet 4 inches. Roof, sandy shale; floor, hard fire clay. The bed was sampled at one point, 200 feet east of shaft, June 4, 1920, by W. W. Weigel, as described below:

Section of coal bed in Smith-Marriott mine

Laboratory No.....	75564
Roof, sandy shale:	Ft. in.
Coal.....	3 4
Clay, soft.....	• 2
Coal.....	10
Floor, clay, hard fire clay.	
Thickness of bed.....	4 4
Thickness of sample.....	4 2

The daily output was 100 tons at time of sampling.

RAY COUNTY

RICHMOND. RAY COUNTY MINE

Analysis 75563 (p. 25). Bituminous coal from Ray County mine, a shaft mine, 1 mile northeast of Richmond on the Atchison, Topeka & Santa Fe Railway. Coal bed, Lexington; Cherokee formation. Thickness, 1 foot 9 inches. Roof, shale overlaid with limestone; floor, limestone. The bed was measured and sampled at one point, 1,300 feet south of shaft, May 13, 1920, by W. W. Weigel, as described below:

• Not included in sample.

Sections of coal bed in Ray County mine

Laboratory No.....	75563
Roof, shale full of pyrite lenses:	Ft. in.
Coal.....	5
Shale.....	* 1½
Coal.....	1 4
Floor, fire clay and limestone.	
Thickness of bed.....	1 10½
Thickness of sample.....	1 9
The daily output was 225 tons at time of sampling.	

* Not included in sample.

ANALYSES OF DELIVERED COAL

By N. H. SNYDER¹⁰

Coal analyses help to describe the character of coal as it lies in the ground or as it is delivered to the users. There is a distinct difference between the "mine samples" and the "delivered samples." Analyses of samples of coal collected from the face of the mine bed are plentiful, but available analyses of samples collected from coal as delivered to the consumer are relatively few.

Mine samples are collected according to a standard method,¹¹ the essential features of which are a channel 2 by 6 or 3 by 4 inches, cut from roof to floor in the face of the bed, and the exclusion from the samples of partings more than three-eighths inch thick and lenses or concretions of sulphur or other impurities more than 2 inches in maximum diameter and one-half inch thick.

Analyses of mine samples form a permanent or scientific record of the coal bed at the point sampled; they are important in determining the character of the coal in any given mine or district. When the samples are taken in a standardized manner these analyses are valuable to an operator for comparison with analyses of delivered coal, and they show him whether or not his mine is being efficiently worked or whether the coal is being properly prepared—which involves the question whether he has suitable mechanical appliances for separating the impurities.

Mine samples may serve as reliable guides for the experienced purchaser of coal who has knowledge of the impurities in the bed and the degree to which these are eliminated in mining and preparing the coal. To the average purchaser unacquainted with these details, however, dependence on mine samples may be misleading. The quality of coal indicated by the face samples can rarely, if ever, be equaled in the delivered coal. Certain impurities that are eliminated from the formally prepared mine sample may not be eliminated by the miner interested in getting out a large tonnage. Some of the roof and floor may also be included if these are soft or flaky. Some analyses of mine samples, particularly those taken from geological reports, may be from either outcrop coal or small workings not beyond the

¹⁰ Engineer in charge of fuel inspection, Bureau of Mines.

¹¹ Holmes, J. A., The sampling of coal in the mine: Tech. Paper 1, Bureau of Mines, 1918, 17 pp.

influence of weathering. When coal prices are high and competition lessened it is easy for the miner and the management to lower the standards of preparation, and a return to rigid standard is always difficult.

In sampling delivered coal the Bureau of Mines follows a definite procedure.¹² A sample of not less than 1,000 pounds is systematically collected by taking equal increments at regular intervals throughout the delivery while coal is being loaded or unloaded and crushing and reducing this gross sample by successive stages to laboratory size.

In using analyses of samples of delivered coal one must recognize, that coal is not always of uniform size and that the impurities are not uniformly distributed throughout the mass. Hence there will be some variation in the results of sampling; and, even though the same mass of coal is sampled a number of times, the analyses would not agree absolutely except by chance. Only when a number of analyses representing a considerable tonnage mined over a period are available do the average value and range of variation of a particular coal become known with certainty. By making reasonable tolerances, however, for these variations, delivered coal can be sampled accurately enough for all practical purposes.

Delivered coal from any given mine may differ from day to day through variations in mining or preparing the coal; hence a record of analysis of delivered coal for any one time should not be considered a permanent record, for the output may be greatly improved by new methods of mining and preparation; or, on the other hand, the output may deteriorate through carelessness in mining or preparation.

Table 5 gives the analyses of samples collected by representatives of the various Government departments under direction of the Bureau of Mines from coal delivered to the Government and by representatives of the Bureau of Mines from coal delivered to railroad cars at mine tipples. The former samples were collected systematically throughout the entire delivery; the latter samples were collected systematically throughout an entire day's run at the mine. These records of delivered coal indicate more nearly what the consumer is likely to receive, but the amount of coal represented and the number of analyses made must be carefully considered.

¹² Pope, G. S., *Methods of sampling delivered coal and specifications for the purchase of coal for the Government*: Bull. 116, Bureau of Mines, 1918, 64 pp.; *Directions for sampling coal for shipment or delivery*. Tech. Paper 133, Bureau of Mines, 1917, 5 pp.

TABLE 5.—Analyses of delivered coal

Where mined			Size of coal	Approximate quantity delivered, tons	Proximate analysis, per cent				Calorific value per pound				Number of analyses averaged	Place of delivery	Date of delivery				
County and town	Mine	Bed			Dry coal				As received		Dry coal					Moisture free and ash free			
					Moisture	As received	Fixed carbon	Ash	Subbur	B. t. u.	Calories	B. t. u.	Calories			B. t. u.	Calories		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
ADAIR COUNTY																			
Novinger.....	Rombauer No. 2	Bevier.....	Nut No. 1.....	16	43.1	8.41	9.23	3	4.2	9,000	5,000	10,770	5,983	14,040	7,800	1	St. Louis testing plant.	1905.	
Do.....	do.....	do.....	Nut No. 2.....	16	43.1	7.41	2.34	1	3.7	8,950	4,972	10,700	5,944	14,100	7,833	1	do.....	Do.	
Do.....	do.....	do.....	Slack.....	17	33.2	0.39	7.28	3	3.6	8,250	4,583	9,970	5,530	13,910	7,728	1	do.....	Do.	
BATES COUNTY																			
Hume.....	N & S (strip pit)	Mulberry.....	Run of mine (crushed).....	500	10.1	33.3	6.48	9	17.5	4,710	710	5,930	11,910	6,617	14,440	8,022	1	Tipple..... May 21, 1924.	
New Home.....	New Home No. 1	Local deposit	Run of mine.....	8	33.6	6.42	3.21	1	5.7	10,500	5,883	11,550	6,417	14,640	8,133	1	St. Louis testing plant.	1904.	
Worland.....	Blue Jay.....	Mulberry.....	Run of mine (crushed).....	200	9.8	33.3	5.43	4	20.8	3,510	360	5,772	11,520	6,400	14,550	8,083	1	Tipple..... May 14, 1924.	
Do.....	Valentine (strip pit).	do.....	do.....	250	11.5	33.5	7.47	3	17.0	3,410	740	5,907	12,140	6,744	14,630	8,128	1	do..... May 15, 1924.	
MACON COUNTY																			
Bevier.....	No. 8.....	Bevier.....	Run of mine.....	32	11.5	33.8	0.42	9	19.1	5,810	180	5,656	11,500	6,389	14,220	7,900	1	St. Louis testing plant.	1904.
Do.....	Central No. 61.....	do.....	Slack through 3/4-in. screen.....	15	23.1	1.44	7	24.2	4	9,100	5,056	10,730	5,961	14,160	7,867	1	do.....	1906.	
Do.....	Nos. 8 and 9.....	do.....	Run of mine.....	813	13.7	36.1	1.40	4	23.5	3,790	350	5,194	10,840	6,022	14,170	7,872	10	Fort Crook, Nebr.....	1911-12.
MILLER COUNTY																			
Barnett (Morgan County).....	Prospect pit.....	Pocket bed.....	do.....	10	12.7	47.6	47.0	5.5	5.9	12,480	6,933	14,300	7,944	15,130	8,406	1	St. Louis testing plant.	1904.	

PUTNAM COUNTY		Mendota		Mendota (Mystic)		Slack through 14" x 1" bar screen.		7 1/2	7 3/4	8	8 1/4	8 1/2	9	9 1/4	9 1/2	10	10 1/4	10 1/2	11	11 1/4	11 1/2	12	12 1/4	12 1/2	13	13 1/4	13 1/2	14	14 1/4	14 1/2	15	15 1/4	15 1/2	16	16 1/4	16 1/2	17	17 1/4	17 1/2	18	18 1/4	18 1/2	19	19 1/4	19 1/2	20	20 1/4	20 1/2	21	21 1/4	21 1/2	22	22 1/4	22 1/2	23	23 1/4	23 1/2	24	24 1/4	24 1/2	25	25 1/4	25 1/2	26	26 1/4	26 1/2	27	27 1/4	27 1/2	28	28 1/4	28 1/2	29	29 1/4	29 1/2	30	30 1/4	30 1/2	31	31 1/4	31 1/2	32	32 1/4	32 1/2	33	33 1/4	33 1/2	34	34 1/4	34 1/2	35	35 1/4	35 1/2	36	36 1/4	36 1/2	37	37 1/4	37 1/2	38	38 1/4	38 1/2	39	39 1/4	39 1/2	40	40 1/4	40 1/2	41	41 1/4	41 1/2	42	42 1/4	42 1/2	43	43 1/4	43 1/2	44	44 1/4	44 1/2	45	45 1/4	45 1/2	46	46 1/4	46 1/2	47	47 1/4	47 1/2	48	48 1/4	48 1/2	49	49 1/4	49 1/2	50	50 1/4	50 1/2	51	51 1/4	51 1/2	52	52 1/4	52 1/2	53	53 1/4	53 1/2	54	54 1/4	54 1/2	55	55 1/4	55 1/2	56	56 1/4	56 1/2	57	57 1/4	57 1/2	58	58 1/4	58 1/2	59	59 1/4	59 1/2	60	60 1/4	60 1/2	61	61 1/4	61 1/2	62	62 1/4	62 1/2	63	63 1/4	63 1/2	64	64 1/4	64 1/2	65	65 1/4	65 1/2	66	66 1/4	66 1/2	67	67 1/4	67 1/2	68	68 1/4	68 1/2	69	69 1/4	69 1/2	70	70 1/4	70 1/2	71	71 1/4	71 1/2	72	72 1/4	72 1/2	73	73 1/4	73 1/2	74	74 1/4	74 1/2	75	75 1/4	75 1/2	76	76 1/4	76 1/2	77	77 1/4	77 1/2	78	78 1/4	78 1/2	79	79 1/4	79 1/2	80	80 1/4	80 1/2	81	81 1/4	81 1/2	82	82 1/4	82 1/2	83	83 1/4	83 1/2	84	84 1/4	84 1/2	85	85 1/4	85 1/2	86	86 1/4	86 1/2	87	87 1/4	87 1/2	88	88 1/4	88 1/2	89	89 1/4	89 1/2	90	90 1/4	90 1/2	91	91 1/4	91 1/2	92	92 1/4	92 1/2	93	93 1/4	93 1/2	94	94 1/4	94 1/2	95	95 1/4	95 1/2	96	96 1/4	96 1/2	97	97 1/4	97 1/2	98	98 1/4	98 1/2	99	99 1/4	99 1/2	100	100 1/4	100 1/2	101	101 1/4	101 1/2	102	102 1/4	102 1/2	103	103 1/4	103 1/2	104	104 1/4	104 1/2	105	105 1/4	105 1/2	106	106 1/4	106 1/2	107	107 1/4	107 1/2	108	108 1/4	108 1/2	109	109 1/4	109 1/2	110	110 1/4	110 1/2	111	111 1/4	111 1/2	112	112 1/4	112 1/2	113	113 1/4	113 1/2	114	114 1/4	114 1/2	115	115 1/4	115 1/2	116	116 1/4	116 1/2	117	117 1/4	117 1/2	118	118 1/4	118 1/2	119	119 1/4	119 1/2	120	120 1/4	120 1/2	121	121 1/4	121 1/2	122	122 1/4	122 1/2	123	123 1/4	123 1/2	124	124 1/4	124 1/2	125	125 1/4	125 1/2	126	126 1/4	126 1/2	127	127 1/4	127 1/2	128	128 1/4	128 1/2	129	129 1/4	129 1/2	130	130 1/4	130 1/2	131	131 1/4	131 1/2	132	132 1/4	132 1/2	133	133 1/4	133 1/2	134	134 1/4	134 1/2	135	135 1/4	135 1/2	136	136 1/4	136 1/2	137	137 1/4	137 1/2	138	138 1/4	138 1/2	139	139 1/4	139 1/2	140	140 1/4	140 1/2	141	141 1/4	141 1/2	142	142 1/4	142 1/2	143	143 1/4	143 1/2	144	144 1/4	144 1/2	145	145 1/4	145 1/2	146	146 1/4	146 1/2	147	147 1/4	147 1/2	148	148 1/4	148 1/2	149	149 1/4	149 1/2	150	150 1/4	150 1/2	151	151 1/4	151 1/2	152	152 1/4	152 1/2	153	153 1/4	153 1/2	154	154 1/4	154 1/2	155	155 1/4	155 1/2	156	156 1/4	156 1/2	157	157 1/4	157 1/2	158	158 1/4	158 1/2	159	159 1/4	159 1/2	160	160 1/4	160 1/2	161	161 1/4	161 1/2	162	162 1/4	162 1/2	163	163 1/4	163 1/2	164	164 1/4	164 1/2	165	165 1/4	165 1/2	166	166 1/4	166 1/2	167	167 1/4	167 1/2	168	168 1/4	168 1/2	169	169 1/4	169 1/2	170	170 1/4	170 1/2	171	171 1/4	171 1/2	172	172 1/4	172 1/2	173	173 1/4	173 1/2	174	174 1/4	174 1/2	175	175 1/4	175 1/2	176	176 1/4	176 1/2	177	177 1/4	177 1/2	178	178 1/4	178 1/2	179	179 1/4	179 1/2	180	180 1/4	180 1/2	181	181 1/4	181 1/2	182	182 1/4	182 1/2	183	183 1/4	183 1/2	184	184 1/4	184 1/2	185	185 1/4	185 1/2	186	186 1/4	186 1/2	187	187 1/4	187 1/2	188	188 1/4	188 1/2	189	189 1/4	189 1/2	190	190 1/4	190 1/2	191	191 1/4	191 1/2	192	192 1/4	192 1/2	193	193 1/4	193 1/2	194	194 1/4	194 1/2	195	195 1/4	195 1/2	196	196 1/4	196 1/2	197	197 1/4	197 1/2	198	198 1/4	198 1/2	199	199 1/4	199 1/2	200	200 1/4	200 1/2	201	201 1/4	201 1/2	202	202 1/4	202 1/2	203	203 1/4	203 1/2	204	204 1/4	204 1/2	205	205 1/4	205 1/2	206	206 1/4	206 1/2	207	207 1/4	207 1/2	208	208 1/4	208 1/2	209	209 1/4	209 1/2	210	210 1/4	210 1/2	211	211 1/4	211 1/2	212	212 1/4	212 1/2	213	213 1/4	213 1/2	214	214 1/4	214 1/2	215	215 1/4	215 1/2	216	216 1/4	216 1/2	217	217 1/4	217 1/2	218	218 1/4	218 1/2	219	219 1/4	219 1/2	220	220 1/4	220 1/2	221	221 1/4	221 1/2	222	222 1/4	222 1/2	223	223 1/4	223 1/2	224	224 1/4	224 1/2	225	225 1/4	225 1/2	226	226 1/4	226 1/2	227	227 1/4	227 1/2	228	228 1/4	228 1/2	229	229 1/4	229 1/2	230	230 1/4	230 1/2	231	231 1/4	231 1/2	232	232 1/4	232 1/2	233	233 1/4	233 1/2	234	234 1/4	234 1/2	235	235 1/4	235 1/2	236	236 1/4	236 1/2	237	237 1/4	237 1/2	238	238 1/4	238 1/2	239	239 1/4	239 1/2	240	240 1/4	240 1/2	241	241 1/4	241 1/2	242	242 1/4	242 1/2	243	243 1/4	243 1/2	244	244 1/4	244 1/2	245	245 1/4	245 1/2	246	246 1/4	246 1/2	247	247 1/4	247 1/2	248	248 1/4	248 1/2	249	249 1/4	249 1/2	250	250 1/4	250 1/2	251	251 1/4	251 1/2	252	252 1/4	252 1/2	253	253 1/4	253 1/2	254	254 1/4	254 1/2	255	255 1/4	255 1/2	256	256 1/4	256 1/2	257	257 1/4	257 1/2	258	258 1/4	258 1/2	259	259 1/4	259 1/2	260	260 1/4	260 1/2	261	261 1/4	261 1/2	262	262 1/4	262 1/2	263	263 1/4	263 1/2	264	264 1/4	264 1/2	265	265 1/4	265 1/2	266	266 1/4	266 1/2	267	267 1/4	267 1/2	268	268 1/4	268 1/2	269	269 1/4	269 1/2	270	270 1/4	270 1/2	271	271 1/4	271 1/2	272	272 1/4	272 1/2	273	273 1/4	273 1/2	274	274 1/4	274 1/2	275	275 1/4	275 1/2	276	276 1/4	276 1/2	277	277 1/4	277 1/2	278	278 1/4	278 1/2	279	279 1/4	279 1/2	280	280 1/4	280 1/2	281	281 1/4	281 1/2	282	282 1/4	282 1/2	283	283 1/4	283 1/2	284	284 1/4	284 1/2	285	285 1/4	285 1/2	286	286 1/4	286 1/2	287	287 1/4	287 1/2	288	288 1/4	288 1/2	289	289 1/4	289 1/2	290	290 1/4	290 1/2	291	291 1/4	291 1/2	292	292 1/4	292 1/2	293	293 1/4	293 1/2	294	294 1/4	294 1/2	295	295 1/4	295 1/2	296	296 1/4	296 1/2	297	297 1/4	297 1/2	298	298 1/4	298 1/2	299	299 1/4	299 1/2	300	300 1/4	300 1/2	301	301 1/4	301 1/2	302	302 1/4	302 1/2	303	303 1/4	303 1/2	304	304 1/4	304 1/2	305	305 1/4	305 1/2	306	306 1/4	306 1/2	307	307 1/4	307 1/2	308	308 1/4	308 1/2	309	309 1/4	309 1/2	310	310 1/4	310 1/2	311	311 1/4	311 1/2	312	312 1/4	312 1/2	313	313 1/4	313 1/2	314	314 1/4	314 1/2	315	315 1/4	315 1/2	316	316 1/4	316 1/2	317	317 1/4	317 1/2	318	318 1/4	318 1/2	319	319 1/4	319 1/2	320	320 1/4	320 1/2	321	321 1/4	321 1/2	322	322 1/4	322 1/2	323	323 1/4	323 1/2	324	324 1/4	324 1/2	325	325 1/4	325 1/2	326	326 1/4	326 1/2	327	327 1/4	327 1/2	328	328 1/4	328 1/2	329	329 1/4	329 1/2	330	330 1/4	330 1/2	331	331 1/4	331 1/2	332	332 1/4	332 1/2	333	333 1/4	333 1/2	334	334 1/4	334 1/2	335	335 1/4	335 1/2	336	336 1/4	336 1/2	337	337 1/4	337 1/2	338	338 1/4	338 1/2	339	339 1/4	339 1/2	340	340 1/4	340 1/2	341	341 1/4	341 1/2	342	342 1/4	342 1/2	343	343 1/4	343 1/2	344	344 1/4	344 1/2	345	345 1/4	345 1/2	346	346 1/4	346 1/2	347	347 1/4	347 1/2	348	348 1/4	348 1/2	349	349 1/4	349 1/2	350	350 1/4	350 1/2	351	351 1/4	351 1/2	352	352 1/4	352 1/2	353	353 1/4	353 1/2	354	354 1/4	354 1/2	355	355 1/4	355 1/2	356	356 1/4	356 1/2	357	357 1/4	357 1/2	358	358 1/4	358 1/2	359	359 1/4	359 1/2	360	360 1/4	360 1/2	361	361 1/4	361 1/2	362	362 1/4	362 1/2	363	363 1/4	363 1/2	364	364 1/4	364 1/2	365	365 1/4	365 1/2	366	366 1/4	366 1/2	367	367 1/4	367 1/2	368	368 1/4	368 1/2	369	369 1/4	369 1/2	370	370 1/4	370 1/2	371	371 1/4	371 1/2	372	372 1/4	372 1/2	373	373 1/4	373 1/2	374	374 1/4	374 1/2	375	375 1/4	375 1/2	376	376 1/4	376 1/2	377	377 1/4	377 1/2	378	378 1/4	378 1/2	379	379 1/4	379 1/2	380	380 1/4	380 1/2	381	381 1/4	381 1/2	382	382 1/4	382 1/2	383	383 1/4	383 1/2	384	384 1/4	384 1/2	385	385 1/4	385 1/2	386	386 1/4	386 1/2	387	387 1/4	387 1/2	388	388 1/4	388 1/2	389	389 1/4	389 1/2	390	390 1/4	390 1/2	391	391 1/4	391 1/2	392	392 1/4	392 1/2	393	393 1/4	393 1/2	394	394 1/4	394 1/2	395	395 1/4	395 1/2	39
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